SCIENTIFIC AMERICAN

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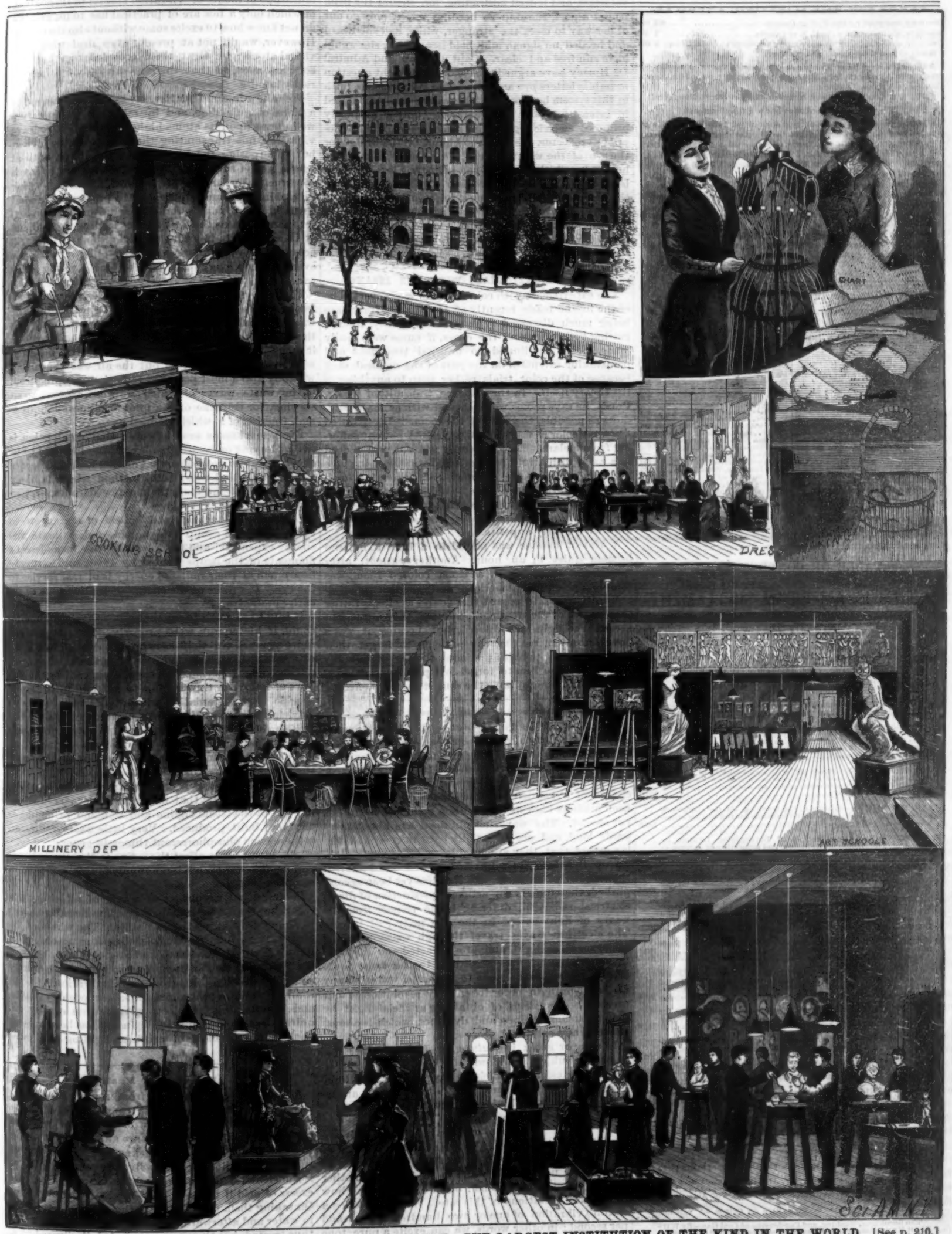

PRATT INSTITUTE FOR INDUSTRIAL EDUCATION, BROOKLYN, N. Y.—THE LARGEST INSTITUTION OF THE KIND IN THE WORLD. [See p. 210.]

Scientific American.

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NEW YORK, SATURDAY, OCTOBER 6, 1888.

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(Illustrated articles are marked with an asterisk.)

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SCIENTIFIC AMERICAN SUPPLEMENT

No. 666.

For the Week Ending October 6, 1888.

Price 10 cents. For sale by all newsdealers.

HOW BEST TO AVOID COLLISION AT SEA.

The recent collision between the steamers Thingvalla and Geiser, the latter being lost, has opened anew in England the discussions regarding lights and signals. The principal objections to such codes of signals as have, as yet, been devised is that, while they give the course being held with admirable promptitude, they do not and cannot give the exact parallel upon which the ship is advancing, if there be any wind, and it is principally under such conditions that danger menaces. Thus, if the signal meaning a stranger is advancing from E. by N. should come over the port bow, the wind being abeam or quartering, the information would be valueless, and indeed misleading, for, should the helm be put a-port, the ship so heeding might only go out of her way to meet the stranger, while, had she heard and heeded no signal, and held her course, she would have run free and clear. Capt. Colomb and Admiral De Horsey have argued the electric side-light question in public letters *pro* and *con*. The Admiral has faith in this system because the lights can be easily regulated in intensity to suit the weather. Another authority proposes electric lights with what he calls a "holophote" reflector, the same to be put on the bridge for the use of the watch officer. An account says: The handle by which this light can be moved is to be regulated absolutely by the position of the helm. When the helm is moved, a detent is released and the ray of light sweeps over the water, giving the same signal to a passing vessel as the driver of a vehicle gives with his hand. When the light has completed its sweep, it is to be automatically shut out.

COLORED LIGHT TRIALS WITH THE INSANE.

The experiments with colored lights in the treatment of the insane made recently at Alessandria, Italy, are being much discussed by the medical faculty, though getting little credence; the cures, if cures were really made, being attributed to unusual treatment and painstaking attention on the part of the medical staff because of the color trials rather than to anything in the theory itself. In the evidence transmitted by Dr. Ponza, he says rooms were selected with as many windows as possible, the walls of the rooms being painted the same color as the window panes. A patient suffering from melancholia, who would not eat, was placed in a room with bright red walls and windows. In three hours he became quite cheerful, and asked for food. Another lunatic, who always kept his hands over his mouth to keep out air and nourishment, was placed in the same room, and the next day was much better and ate with a hearty appetite.

A violent maniac was placed in a blue room, and became quiet in an hour. Another patient, after spending a whole day in a violet colored room, was completely cured. American and English medical authorities seem to regard these cures as effects rather than causes of the treatment, induced, they argue, not because the light was colored, but because it was a novel sensation, making the patients to forget their inclinations, as pebbles put into the ear of a balky horse will cause him to forget his pranks; a sudden bath or shock might have the same transitory effect.

Manufacture of Light without Heat.

Prof. Oliver J. Lodge has been endeavoring to manufacture light by direct electric action without the intervention of heat, utilizing for the purpose Maxwell's theory that light is really an electric disturbance or vibration. The means adopted is the oscillatory discharge of a Leyden jar, whose rate of vibration has been made as high as 1,000 million complete vibrations per second. The waves so obtained are about three yards long, and are essentially light in every particular except that they are unable to affect the retina. To do this they must be shortened to the hundred-thousandth of an inch. All that has yet been accomplished, therefore, is the artificial production of direct electrical radiation, differing in no respect from the waves of light except in the one matter of length. The electrical waves travel through space with the same speed as light, and are refracted and absorbed by material substances according to the same laws. We only need to be able to generate waves of any desired length in order to entirely revolutionize our present best systems of obtaining artificial light by help of steam engines and dynamos, which is a most wasteful and empirical process.

In a paper given in *Nature*, Dr. Lodge further discusses the subject as follows:

The conclusions at which we have arrived, that light is an electrical disturbance, and that light waves are excited by electric oscillations, must ultimately, and very shortly, have a practical import.

Our present systems of making light artificially are wasteful and ineffective. We want a certain range of oscillation, between 7,000 and 4,000 billion vibrations per second; no other is useful to us, because no other has any effect on our retina; but we do not know how to produce vibrations of this rate. We can produce a definite vibration of one or two hundred or thousand per second; in other words, we can excite a pure tone of definite pitch, and we can command any desired range of such tones continuously by means of bellows and a key board. We can also (though the fact is less well known) excite momentarily definite ethereal vibrations of some millions per second, as I have at length explained; but we do not at present seem to know how to maintain this rate quite continuously. To get much faster rates of vibration than this we have to fall back upon atoms. We know how to make atoms vibrate; it is done by what we call "heating" the substance, and if we could deal with individual atoms unhampered by others, it is possible that we might get a pure and simple mode of vibration from them. It is possible, but unlikely; for atoms, even when isolated, have a multitude of modes of vibration special to themselves, of which only a few are of practical use to us, and we do not know how to excite some without also the others. However, we do not at present even deal with individual atoms; we treat them crowded together in a compact mass, so that their modes of vibration are really infinite.

We take a lump of matter, say a carbon filament or a piece of quicklime, and by raising its temperature we impress upon its atoms higher and higher modes of vibration, not transmuting the lower into the higher, but superposing the higher upon the lower, until at length we get such rates of vibration as our retina is constructed for, and we are satisfied. But how wasteful and indirect and empirical is the process. We want a small range of rapid vibrations, and we know no better than to make the whole series leading up to them. It is as though, in order to sound some little shrill octave of pipes in an organ, we were obliged to depress every key and every pedal, and to blow a young hurricane.

I have purposely selected as examples the more perfect methods of obtaining artificial light, wherein the waste radiation is only useless, and not noxious. But the old-fashioned plan was cruder even than this; it consisted simply in setting something burning, whereby not only the fuel but the air was consumed, whereby also a most powerful radiation was produced, in the waste waves of which we were content to sit stewing, for the sake of the minute, almost infinitesimal, fraction of it which enabled us to see.

Every one knows now, however, that combustion is not a pleasant or healthy mode of obtaining light; but everybody does not realize that neither is incandescence a satisfactory and unwasteful method which is likely to be practiced for more than a few decades, or, perhaps, a century.

Look at the furnaces and boilers of a great steam engine driving a group of dynamos, and estimate the energy expended; and then look at the incandescent filaments of the lamps excited by them, and estimate how much of their radiated energy is of real service to the eye. It will be as the energy of a pitch pipe to an entire orchestra.

It is not too much to say that a boy turning a handle could, if his energy were properly directed, produce quite as much real light as is produced by all this mass of mechanism and consumption of material.

There might, perhaps, be something contrary to the laws of nature in thus hoping to get and utilize some specific kind of radiation without the rest, but Lord Rayleigh has shown in a short communication to the British Association, at York, that it is not so, and that, therefore, we have a right to try to do it.

We do not yet know how it is true, but it is one of the things we have got to learn.

Any one looking at a common glow worm must be struck with the fact that not by ordinary combustion, nor yet on the steam engine and dynamo principle, is that easy light produced. Very little waste radiation is there from phosphorescent things in general. Light of the kind able to affect the retina is directly emitted, and for this, for even a large supply of this, a modicum of energy suffices.

Solar radiation consists of waves of all sizes, it is true; but then solar radiation has innumerable things to do besides making things visible. The whole of its energy is useful. In artificial lighting nothing but light is desired; when heat is wanted it is best obtained separately, by combustion. And so soon as we clearly recognize that light is an electrical vibration, so soon shall we begin to beat about for some mode of exciting and maintaining an electrical vibration of any required degree of rapidity. When this has been accomplished, the problem of artificial lighting will have been solved.

Removal of Rust.

A method of removing rust from iron consists in immersing the articles in a bath consisting of a nearly saturated solution of chloride of tin. The length of time during which the objects are allowed to remain in the bath depends on the thickness of the coating of rust; but in ordinary cases twelve to twenty-four hours is sufficient The solution ought not to contain a great excess of acid if the iron itself is not to be attacked. On taking them from the bath, the articles are rinsed in water and afterward in ammonia. The iron, when thus treated, has the appearance of dull silver; but a simple polishing will give it its normal appearance.

The Waste of Anthracite and the Exhaustion of the Supply.

The statistics of coal production, which we publish in our usual market report, show that during the month of August the shipments of anthracite from the Pennsylvania mines to market amounted to 4,097,563 gross tons, which is the largest anthracite output ever made in one month, and is at the rate of 49,000,000 tons a year.

During the eight months of the present year, the shipments of anthracite to market have amounted to 29,619,291 tons, being 1,755,495 tons in excess of the shipments during the corresponding period in 1887. During the months of September, October, November, and December, 1887, the shipments amounted to 12,777,322 tons, and as we shall certainly largely exceed that amount this year, it appears probable that we shall send to market this year 37½ or 38 million tons of anthracite.

If we include the coal sold and used at the mines, say 6 per cent of the shipments, the grand total output for the year will probably amount to 40,000,000 gross tons.

The average waste of anthracite in mining and preparation for market has been carefully estimated from many reliable data by the Geological Survey of Pennsylvania, as follows:

Coal left in pillars, etc.	45	per cent.
Coal lost in mining by blasting, etc.	15	"
Breaker waste 16 per cent of 40 per cent.	6·4	"
Total loss	66·4	"

Or only about *one-third of the coal goes to market;* if therefore we produce 40,000,000 tons this year, it represents the exhaustion of 120,000,000 tons of our available supply, and this does not now much, if at all, exceed 9,000,000,000 tons.

At the present rate of production and present percentage of waste in mining, our entire supply of anthracite coal will last only 75 years.

This statement is not based on any mere *guess*, but is founded on reliable data, and it is so startling in its significance that it should certainly attract the attention of the managers of our great coal companies, and even of the government of the State of Pennsylvania. It is not claimed that we have yet reached our maximum production, and every increase means that the coal will be worked out in proportionately less time than here stated.

Long before the supply has been exhausted, the demand for anthracite will have exceeded the supply, and prices will be limited only by the prices of other fuels; and as cheap fuel is the very foundation of industrial prosperity, it is not difficult to imagine the resulting effect on the industries of a large part of this country.

The present enormous, disgraceful, and unnecessary waste in mining anthracite should be stopped, and if the interests of the great coal companies are not sufficient to impel them to do this, then the government of the State, which is the guardian of the citizens' interests, should intervene to save these from the disastrous consequences of the spendthrift policy of those who now monopolize our invaluable supplies of this fuel.—*Eng. and Min. Jour.*

Vegetable Cows.

Several natural orders of the vegetable kingdom include plants that are characterized by the secretion of a fluid closely resembling milk in appearance and consistency, and a familiar example of these is to be seen in our common milkweed (*Asclepias cornuti*), which is well known to everybody. In some plants, this milky fluid is of the most venomous nature; in others, it possesses active medicinal virtues; in others, it yields a product (such as India rubber and gutta percha) of the highest importance to the arts and industries; and, in others still, it proves of value as a human aliment. Since the same general properties characterize the plants of each natural family, it seems an anomaly that, in the same order, we should find the species of one genus producing a lactescent fluid of a highly poisonous nature, and those of another yielding one that is entirely innocuous. Yet such is often the case, and we have a striking example of it in the bread fruit order, the Artocarpaceæ, which, on the one hand, includes the celebrated upas tree of Java, which, when pierced, exudes a milky juice containing an acrid virulent poison (antiarin), the smallest quantity of which will kill the largest animal, and, on the other, the famous *Brosimum utili* of South America, which yields a copious supply of rich, wholesome milk, of as good a quality as that from the cow. There are several other instances in the vegetable kingdom of such an association, in the same natural order, of plants that produce a noxious lactescent juice with others which yield a wholesome one adapted for man's use, and which may therefore be designated as "vegetable cows." To speak only of the latter class, the most remarkable example is the species of *Brosimum* just mentioned, which was discovered and made known by the celebrated traveler Humboldt. This tree forms extensive forests on the mountains near the town of Coriaco, and elsewhere along the sea coast of Venezuela—growing to upward of one hundred feet in height, with a trunk six or eight feet in diameter, and branchless for the first sixty or seventy feet of its height. It is popularly known as the cow tree, Palo de Vaca, or Arbol de Leche. "Its milk, which is obtained by making incisions in the trunk, so closely resembles the milk of the cow, both in appearance and quality, that it is commonly used as an article of food by the inhabitants of the places where the tree is abundant. Unlike many other vegetable milks, it is perfectly wholesome and very nourishing, possessing an agreeable taste, like that of sweet cream, and a pleasant balsamic odor, its only unpleasant quality being a slight amount of stickiness. The chemical analysis of this milk has shown it to possess a composition closely resembling some animal substances, and, like animal milk, it quickly forms a yellow, cheesy scum upon its surface, and, after a few days' exposure to the atmosphere, turns sour and putrefies. It contains upward of thirty per cent of a resinous substance called *galactin* by chemists." (*Treas. of Botany.*) Speaking of this tree, Humboldt says: "They [the natives] profess to recognize, from the color and thickness of the foliage, the trunks that yield the most juice, as the herdsman distinguishes, from external signs, a good milch cow. Amidst the great number of curious phenomena that I have observed in the course of my travels, I confess there are few that have made so powerful an impression on me as the aspect of the cow tree. A few drops of vegetable juice recall to our minds all the powerfulness and fecundity of nature. On the barren flank of a rock grows a tree with coriaceous and dry leaves. Its large woody roots can scarcely penetrate into the stone. For several months in the year, not a single shower moistens its foliage. Its branches appear dead and dried, but when the trunk is pierced, there flows from it a sweet and nourishing milk. It is at the rising of the sun that this vegetable fountain is most abundant. The negroes and natives are then seen hastening from all quarters, furnished with large bowls to receive the milk, which grows yellow and thickens at the surface. Some empty the bowls under the tree itself, others carry the juice home to their children."

In the Dogbane order, the Apocynaceæ, which includes plants that are mostly of a venomous nature and possess an exceedingly acrid and drastic juice, we have a second example of a tree that secretes a wholesome, milk-like fluid. This is the *Tabernæmontana utilis*, the cow tree of Demerara, or hya-hya of the natives. This tree grows in abundance in the forests of British Guiana, and its bark, when tapped, yields a copious supply of thick, sweet milk, resembling that of the cow in appearance, but rather sticky from the presence of caoutchouc. This milk mixes freely with water, is of a pleasant flavor, and the natives employ it as a refreshing beverage.

Two "cow trees" are found in the order Sapotaceæ, which embraces numerous plants valuable for their succulent fruits, such as the marmalade, star apple, etc. One of these is the *Mimusops elata*, called by the natives massarandaba or aprain, and which Professor Orton, in the *Andes and the Amazons*, describes as one of the noblest trees of the forests of Para. It stands from 180 to 200 feet in height, is 20 feet in circumference, and is crowned with a vast dome of foliage. The milk yielded by the bark has the consistency of cream, and is used for tea, coffee, and custards. It hardens by exposure, so as to resemble gutta percha, which, indeed, is the product of a Malaisian tree belonging to the same natural order. The other tree is the *Mimusops balata*, or bully tree, of English, French, and Dutch Guiana. The milk of this species is sometimes employed with tea or coffee, instead of cow's milk, but has the disadvantage of hardening very rapidly upon exposure to the air.

The natural order Asclepiadaceæ consists of plants that are almost always milky, and the milk is usually acrid and bitter, and always to be suspected, yet one of the plants of the family, *Gymnema lactiferum*, the cow plant of Ceylon, called by the natives kiriaghuna, yields a milk which the Cingalese make use of as food.

Another example of a "cow tree" belonging to a dangerous natural order, the Euphorbiaceæ, which embraces plants having acrid and purgative juices, is the *Euphorbia balsamifera*, or Tabayba dolce, of the Canaries. Notwithstanding the fact that the plants of this genus have juices that possess very active medicinal qualities, and are in some cases so venomous that they are used as arrow poisons, the juice of the species under consideration is innocuous, and, according to Leopold von Buch, is similar to sweet milk, and is eaten as a delicacy after being thickened into a jelly.

Still another "cow tree" is found in the order Clusiaceæ or Guttiferæ, which embraces plants that secrete an acrid, purgative, yellow gum resin, such as gamboge. This tree is the *Clusia galactodendron*, a native of Venezuela, where it is known as Palo de Vaca. It has a thick bark, covered with rough tubercles, and its internal tissue becomes red when exposed to the air. In extracting the milk, the inhabitants make incisions through the bark till the wood is reached. These cuts are said to be made only before full moon, it being imagined that the milk flows more freely then than at any other time. One tree will yield a quart in an hour. The milk is freely used by all, especially by children, although it has a somewhat astringent taste.

In the order *Moraceæ*, which includes the mulberry and fig, there are several species of *Ficus* that are known as cow trees, and the milky fluid of which is bland and used as a beverage, although in most of the species of the genus the juice is exceedingly acrid.

Fall Cleaning Up.

The *Manufacturers' Gazette* suggests to its readers that now is a capital time to prepare for winter, both inside of the mill and around the outside premises. Taking advantage of the cool, dry, and clear days to repaint sash, clean windows, and paint up your wooden buildings will be infinitely better than to leave things all demoralized for winter storms to beat upon. Now that the days are visibly shortening, it will soon be that daylight will be greatly retarded by dirty windows. Put in the odd panes of glass; do a little whitewashing or painting; in fact, clean up thoroughly. Make the mill as cheery and comfortable as possible for the help during the dark wintry days. Have your circulation piping carefully looked over, and all leaky valves and joints packed, to prevent unnecessary waste of fuel. Patch up those holes and cracks in the brickwork and floors. See that all outside doors are in working order and weatherproof. Perhaps the roof will bear a little investigation and renewing in spots.

These are all little things, but they require attention at the proper time, for if allowed to go loose they will count up in the aggregation of shiftlessness.

Out in the yard we may have a pile of scrap iron, odd pieces of lumber, and what not, which may be required during the winter. Gather this stuff all together and cover it up with a board roof if possible; if not, use old drier canvas. Anything is better than to have it snowed under and hunted for some night with a lamp and shovel with the thermometer around zero. Odd machinery, like pulleys, gears, or pieces of shaft, should be blocked up off the ground, as when not so cared for they settle into the earth, and, if not frozen down, will become badly rusted at the ground contact. Piping and fittings especially should be housed, as they are so liable to damage by lying loose outside.

The Congress of American Physicians and Surgeons.

The above organization began its first triennial meeting in Washington, D. C., on the afternoon of September 18, the business of the assemblage filling up pretty well the remainder of the week. The attendance at first included 200 members, which at the later sessions was considerably increased. Dr. John S. Billings, the eminent sanitarian, was elected president. The papers were read before eleven sections, each section representing a body of specialists. The great number of papers thus disposed of makes even a recapitulation of their titles an impossibility. One, however, may be noted as being of sadly increased interest at the present moment. Major G. M. Sternberg read a paper upon "Recent Investigations Relating to the Etiology of Yellow Fever." He reviewed the germ investigations of Drs. Freire, Finlay, and Gibier, and announced his belief that the specific microbe of yellow fever had not yet been found. Major Sternberg is still engaged in his researches, but gave no promise that an effectual yellow fever prophylactic would be ever found.

Electric Street Cars in New York City.

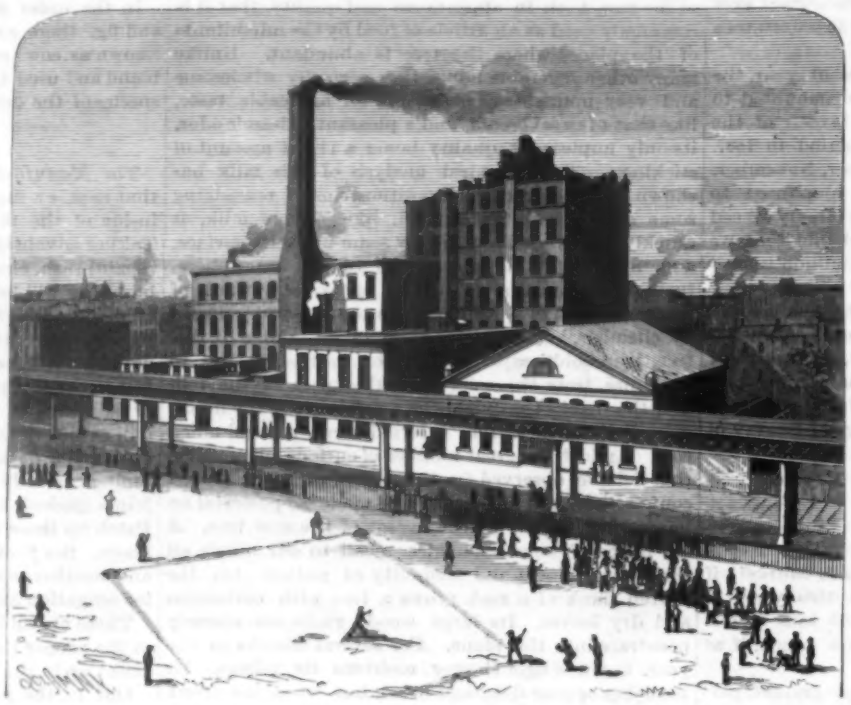
Electric traction cars, in the place of horse cars, began making trips in the public service on the Fourth Avenue line, New York City, on September 17, the Julien storage battery system being employed. The battery for a car consists of 144 cells, made to slide under the seats from the outside on trays. The general construction of the Julien battery, and the method of charging it, was given in the SCIENTIFIC AMERICAN of May 7, 1887. Each truck carries a motor capable of propelling four cars, to guard against danger of a breakdown, and the battery as furnished to the car is designed to afford sufficient power to drive it thirty to forty miles with an ordinary load. The same motor that propels the car furnishes the light to supersede the oil lamps heretofore used. The electric cars are two feet longer than the horse cars on the same line, which, it is said, the company intend to change into electric cars, should the new system prove to be what is hoped for in practical use for city travel.

THE idea of a nation with the wealth and mechanical skill of the United States having to go abroad for its guns for warfare is ridiculous. Sporting arms, equal in workmanship to any manufactured in the world, are made in this country, and there is no reason why the heavier ordnance should not also be made here. There is a bill pending before Congress to appropriate ten millions a year for this purpose. If the bill passes, it will open an extensive field to American manufacturers.—*Stoves and Hardware.*

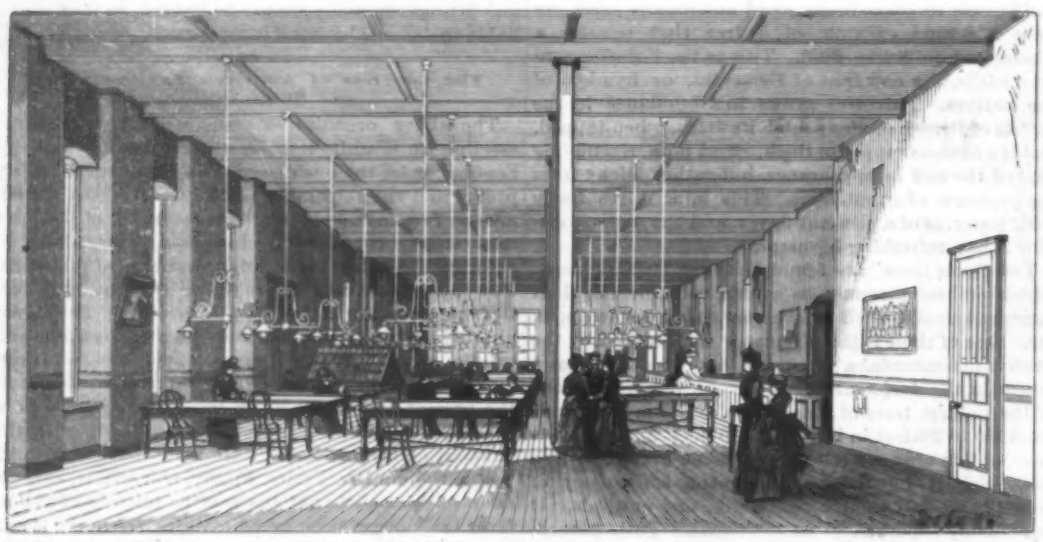
PRATT INSTITUTE, BROOKLYN, N. Y.

In matters of education, as well as in business and all modern enterprises, concentration is the order of the day. Specific courses of study for specific purposes have become an absolute necessity; and while a classical or scientific education is a necessary preliminary to professional occupations, it is no longer possible for a general education to cover the great multitude of known subjects with sufficient completeness to render such an education of any practical value. A great majority of people are dependent upon trades, and these, in many cases, are quickly and imperfectly learned without even a rudimentary education as a basis. In most cases people are obliged to earn a livelihood while learning how to get a living. As a consequence, the time for learning a trade is made as short as possible. It is learned, it may be, from a master who is such only in name, and thus it is that the country possesses many workers who, for a lack of correct training in the beginning, make life a failure.

There are in this country several institutions for technical education which are practical, useful, and highly beneficial to those who avail themselves of their privileges, but there is nothing so good or so perfect that it cannot be improved upon. Of course, it is to be expected that every institution will—so far as practicable—keep up with the times, but an industrial institute starting to-day has the benefit of accumulated experience and of being imbued with the feeling and spirit of the present time. An institute having these advantages has grown in our vicinity to gigantic proportions in such a quiet way that, notwithstanding it is more than a year old and has involved the expenditure of millions of dollars, it is scarcely known beyond its immediate locality. We refer to the Pratt Institute, of Brooklyn, N. Y. The present obscurity of this great enterprise is partly due to the innate modesty of its founder, Mr. Charles Pratt, and partly to his cautious methods.



THE PRATT INSTITUTE, BROOKLYN, N. Y.—VIEW FROM THE REAR PLAYGROUNDS.



THE PRATT INSTITUTE—THE FREE READING ROOM.

The philanthropic scheme which culminated in the founding of this remarkable institution was the dream of Mr. Pratt's youth. In early life he was forced to learn what it meant to economize in everything. His education was secured through his own industry and perseverance. He learned the machinist's trade, and by hard work earned enough money to carry him through school. While in school he practiced the severest economy, boarding himself at the cost of a dollar a week. He kept his wants small and in every way husbanded his resources, so as to complete his education without taking upon himself the burden of debt. In these days of close calculation and denial he thought of others in conditions similar to his own, and conceived the idea of working out a scheme of some kind for the amelioration of the condition of other youth and of the world's workers generally. The idea assumed different forms at successive stages of his career, until at length it developed into a scheme for the founding of a great institute for technical education and manual training. This institute is no longer a faint conception or well-defined scheme, but is a substantial reality, a monument to the philanthropy and wisdom of its founder, an ornament to the city in which it is located, and a credit to the country at large. It is undoubtedly the most important enterprise of the kind in this country, if not in the world.

The buildings of the Pratt Institute in Brooklyn contain from three to four acres of floor space, and vary in height from one to six stories. They are located on a plot of land situated between Ryerson Street and Grand Avenue and between De Kalb and Willoughby Avenues, the main building fronting on Ryerson Street, and the buildings for the department of mechanic arts fronting on Grand Avenue. Across Ryerson Street, opposite the main building, is a plot of ground, 350 × 200 feet, extending through the block to St. James' Place, the plot serving at present as a playground for the young ladies connected with the Institute. Across Grand Avenue, opposite the department of mechanic arts, is a plot 250×200 feet which serves as a playground for the boys.

The main building of the Institute is a brick and terra cotta structure six stories high, 100 feet wide, 50 feet in depth, with an L 37×50 feet upon one side. In the rear of the Institute proper is the department of mechanic arts, covering an area 247×95 feet, these buildings varying from one to three stories in height.

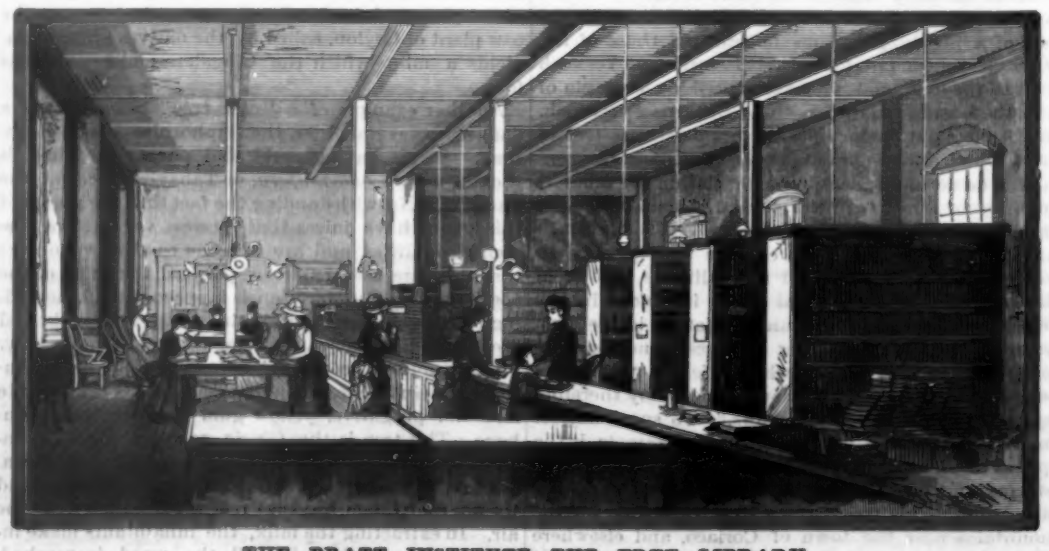
A front view of the Institute buildings is presented in the upper central picture of our large engraving, and the rear, or Grand Avenue side, is shown in one of the smaller engravings. The buildings are provided with all the modern appliances for lighting, heating, ventilation, the prevention of fire, etc. In the main building is a large elevator running from the basement to the tower above, adapted for both passenger and freight service. The buildings are lighted throughout by a complete system of incandescent and arc lamps, rendering evening work in the various classrooms and shops as practicable as that of the day. The buildings—as will be seen by reference to the engravings—are not wanting in external beauty, while they are constructed in the most substantial manner, being practically fireproof, and as strong as would be required for the heaviest kind of manufacturing.

Land for the buildings was purchased in 1884. Contracts were made in the early part of 1885; the work of excavating began about July 1 of that year, and the construction was continued through 1886-87. May 19, 1887, the charter was granted, with power to confer degrees.

In addition to the facilities for technical education, which are designed exclusively for scholars, there are three features of interest to the general public: a free library containing several thousand choice books, to which additions are constantly being made; a free reading room provided with about 150 of the best American and foreign periodicals, and furnished with a library of reference books, such as encyclopedias, dictionaries, and other books often needed for consultation; and a technical museum containing specimens of manufactured articles, together with the crude materials from which they were made, the specimens being arranged to show the various processes through which the materials pass from their original state to the finished product.

The Institute will accommodate several thousand students, who will be charged for the privileges of the institution, but the amount is very low, and all the revenues are to be devoted to the support of the Institute. In addition to this source of revenue, Mr. Pratt has built in Greenpoint, L. I., an apartment building known as the "Astral," the rental of which goes to the support of the Institute. This building cost about $400,000. It is one of the most complete and perfectly arranged apartment houses ever constructed. We doubt the existence of its equal. It is a little city of itself, with every modern appliance for the comfort of its inmates. Still, the rentals are easily within the means of mechanics and laboring men. These apartments, we are informed, are to be deeded to the Pratt Institute.

Part of the basement of the main building of the Institute will be utilized for a lunch room. Upon the first floor of the main building are the library and reading room. A portion of the second floor is set apart for the general offices of the Institute, the remainder being arranged as a lecture hall, in which lec-



THE PRATT INSTITUTE—THE FREE LIBRARY.

tures upon various subjects are to be delivered from time to time. It is intended that these lectures shall bear directly upon the work of the Institute in all its phases, and shall thus include practical instruction upon those matters which pertain to right modes of living, the problems of political and social life, domestic economy, sanitary science, literary culture, ethics, etc. While many of these lectures may be given as a part of the regular work of the Institute to pupils only, yet many others will be so arranged as to meet the wants of those not directly connected with the Institute, but who wish an opportunity of obtaining systematic instruction upon subjects of interest and importance. The third floor is devoted to sewing, dressmaking, millinery, and art embroidery. In the sewing department instruction is given in all kinds of hand sewing, in machine sewing, and in cutting and making plain garments from patterns. In the dressmaking department a systematic course in dressmaking is given. Each pupil, under the guidance of a competent teacher, learns to fit from measure, make and drape an entire dress for herself or others. In the department of millinery each pupil makes during the course an entire hat or bonnet, combining good taste and good workmanship. The department of art embroidery is intended to train women in designing, due attention being paid to harmony of colors and symmetry of forms.

One of the helpful departments of the institution is the school of shorthand and typewriting, located on the third floor. The work done in this department is thorough and practical.

The entire fourth floor of the main building and the art hall of the sixth floor are occupied by the school of art and design. A great deal of attention has been given to the arrangement of the various rooms of this department, and to the selection of examples for drawing, casts and photographs in large numbers having been purchased in Europe for the use of the students. Every facility is provided for thorough and systematic work, and pupils may here pursue regular courses in drawing and painting, design, clay modeling, wood carving, architectural and mechanical drawing. In connection with the courses, lectures are given on architecture, historic ornament, perspective, design, theory of color, mythology, and artistic anatomy. As drawing is the basis of all constructive industries, pictorial art, and decorative design, this is one of the most important departments of the institution. Particular attention will be given to instruction in sculpture and wood carving, with special reference to the development of a high class of art work in bronze, copper, and stone. This department will be instituted for the purpose of encouraging ladies desiring to become proficient in these branches of art.

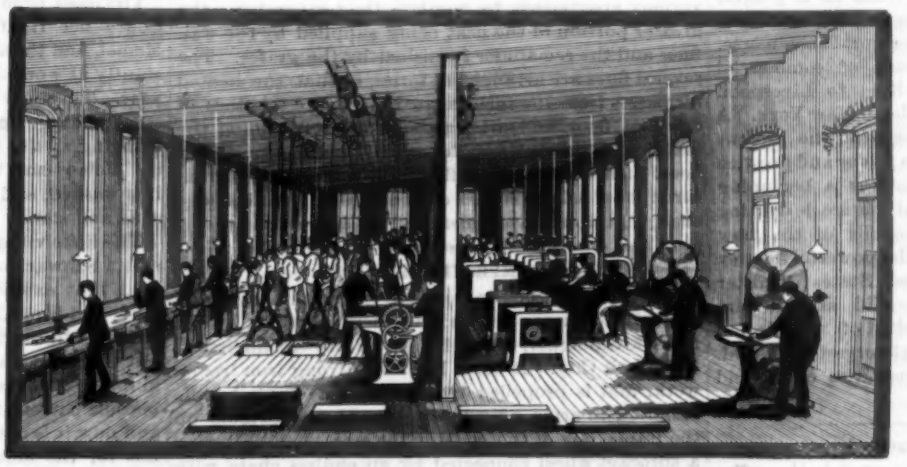
The fifth floor of the main building is set apart for the technical museum. The museum hall proper is provided with rows of substantial oak cases of two classes, vertical and horizontal, all the cases being provided with air tight plate glass doors. In these cases are arranged various wares in different states of completion; some of the finest specimens of glassware, ceramics, bronzes, iron and brass work to be obtained in Europe are shown in these cases. The collection of specimens was begun in Europe in the summer of 1887. At present, the museum contains about 4,000 specimens, being most complete in the department of ceramics. There are specimens of the raw material used in the manufacture of earthenware, faience, porcelain, and various samples from the celebrated manufactories of Berlin, Dresden, Vienna, Sevres, Limoges, Worcester, Derby, and from the Staffordshire potteries of Wedgwood, Minton, Copeland, Doulton, etc. Switzerland, Sweden, Denmark, Russia, and Italy are also represented, the last country by many fine pieces of faience, from Nove, Milan, Bologna, Paroes, Rome, and Naples. In antique pottery there are specimens of Græco-Etruscan and Flemish stoneware, of German and Roman earthenware, and also of pottery from the mounds of the Mississippi Valley, with some pieces of modern clay work by the Indians of Mexico.

THE PRATT INSTITUTE—THE MUSEUM.

Glass is exhibited in various forms, blown, cut, engraved, etched, enameled, and ornamented in many colors, from the works in Austria, Bohemia, Germany, and France, also many pieces of beautiful cameo glass from Messrs. Webb, at Stourbridge, England. Venetian glass also is shown in great variety of modern and mediæval designs, rich in color and unique in form. There are also specimens of Roman, Florentine, and Venetian mosaic work from the laboratory of Dr. A. Salviati.

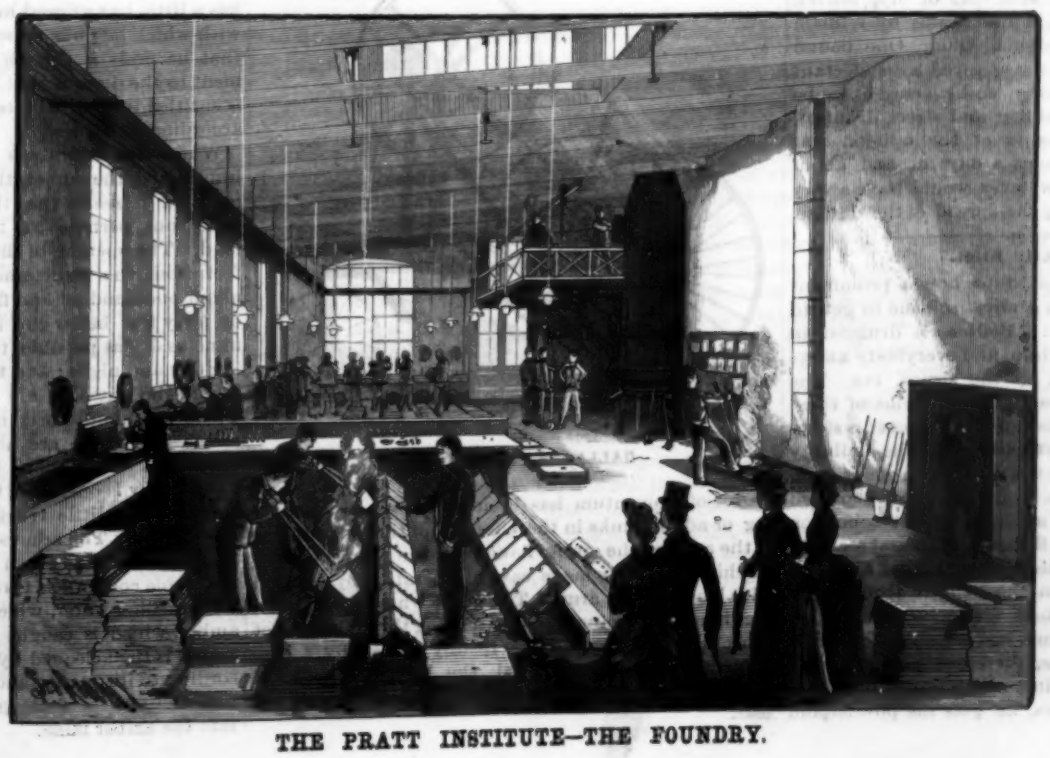
A set of models from Germany, showing the enamel work of various countries, is represented. Copper, iron, tin, zinc, and other metals, with their alloys, are exhibited in solid, filigree, inlaid, engraved, and repousse work, together with a few choice pieces of Venetian, French, Russian, and American bronze. A large number of ores are exhibited to show the material from which the metals have been derived, and these are placed in close proximity to the artistic and skillfully worked metal. The collection of American materials and manufactures is being rapidly made. It will soon be possible for a visitor to compare the finest specimens of handicraft from both hemispheres.

A part of the collection consists of many species of minerals, and a large number of crystal models in wood and glass, arranged to give an insight into the science of mineralogy. The celebrated diamonds and other gems of the world are represented by handsomely cut facsimiles. A series of rocks, arranged according to Rosenbusch, contains about 600 European specimens, and near these are placed the same number of American specimens. Although the collection is not complete, it shows what may be brought out of the earth by intelligence, labor, and skill.



THE PRATT INSTITUTE—THE WOODWORKING SHOP.

Upon the sixth floor of the main building is the art hall, provided with a large skylight. It is used for advanced free hand drawing and painting, and for the exhibition of art collections. Upon this floor also are two cooking schools, provided with all the appointments of a well ordered kitchen, including a superb range, gas stoves, galvanized iron sinks, hot and cold water faucets, closets, dressers, refrigerators, etc. Under the skylight, in the central portion of the rooms, are arranged large cooking tables, each furnished with gas burners for cooking and drawers with shelves below. Every drawer and set of shelves is supplied with a complete assortment of cooking utensils, so that twenty people can work at the same time in each room. There are three courses in cooking, of twelve lessons each, advancing regularly from the simplest to the more elaborate dishes. Every pupil is required to give evidence of her thorough acquaintance with the elements of cooking before passing to the higher course. Each pupil is required to work out with her own hands the recipe given her. The instruction comprises lessons on building and taking care of a fire, the proper modes of measuring liquids and solids, of boiling meats, eggs, vegetables, broiling and roasting meats, making soups, puddings, and—most important of all—bread. In connection with every lesson a brief lecture of explanation is given by the teacher on the chemical and nutritive properties of the materials used, the changes produced by cooking, etc.



THE PRATT INSTITUTE—THE FOUNDRY.

(*Continued on page* 214.)

The Future of New York.

Mr. A. H. Green, formerly comptroller and park commissioner of New York, predicts that the town of Westchester, the whole of Kings County, of Flushing, Newtown, and Jamaica, in Queens County, and the whole of Staten Island will be absorbed in the corporation of New York, giving to the city an area of about 320 square miles, as compared with London with an area of 687 square miles. To effect this object, Mr. Green would remove all obstacles, open ways, build bridges, and make it cheap and convenient to live in New York. From the easternmost point of Staten Island to the northerly line of the city, being the southerly line of Yonkers, would be 32 miles. From the Battery to its extreme northerly line would be, say, 18 miles, and from the Hudson River to the easterly line of Flushing would be about 7¼ miles. It cannot be kept too constantly in mind, says Mr. Green, that New York is, and is to be, the great manufacturing center of the American continent. Its domestic is probably three times its foreign commerce. No impediment should be placed in the way of conveniences for continuing the hold of New York on the great continental traffic which by all the rights of topographical advantages belongs to it. The Hudson should be bridged, of course avoiding needless obstructions to the waterway. The great continental railway lines must be afforded facilities in establishing their terminals there. Where capitalists are willing to embark their money to open new ways to the city, to bridging and tunneling the adjacent waters, they should be encouraged, not opposed by vexatious legislation. Within a radius of 25 miles from the Battery in Jersey there are more people to-day than in Brooklyn, more than in the whole State of Connecticut, and the day is not distant when the necessities of business and the convenience of administration will force a concentration of the various towns, cities, and villages within the above radius into one great municipality, with immense advantages for the accommodation of domestic traffic and with excellent water facilities.

Apropos to the above, Mr. Simon Stevens, a lawyer of some note in this city, is reported by the New York *Tribune* as saying: "It is a curious thing in the study of the world's history to see how the commercial center has shifted, from time to time, in a general course around the globe. You can go back to a time when Antwerp was the center of the world's commerce. Next Amsterdam held the threads of commercial venture. Then the center was shifted to Liverpool. Now it is London. Next it will be in New York. A careful study of the world's commerce at the present time gives sure indications that the power and prestige of England in her commercial relations is beginning to be shaken, while the commercial empire is drifting across the Atlantic to the metropolis of the new world." And as indicating what the powerful money kings of Europe think, ex-United States Minister Noyes reports that Baron Rothschild said to him recently: "The financial prosperity of the United States is without a parallel in the history of the world. You are drawing from all the treasuries of the old world to fill your own."

A Disinfectant Suggested.

The following circular has been posted in the office of the health board of this city:

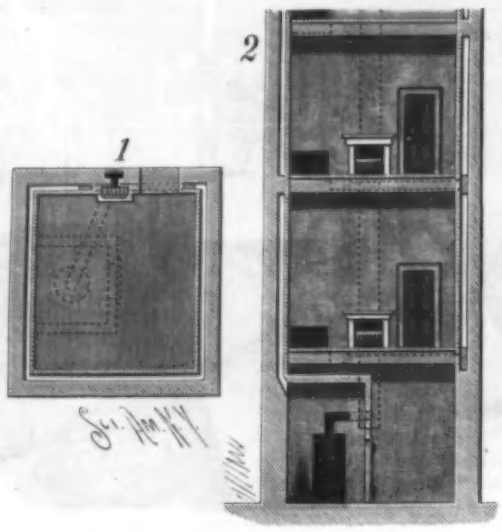
Experiments by the chemist of this department, Dr. E. W. Martin, warrant the belief that great advantage would result, in places suffering from yellow fever, from a free use of bromide in solution. It has a valuable function in destroying germs by oxidation. Bromine can be purchased at a cost of 37½ cents a pound, and is manufactured in a large way by William R. Shields, at New Philadelphia, Ohio. One pound dissolved in 100 gallons of water gives a disinfectant and deodorizer of great power, cheap enough to be used freely in ground sprinkling and street disinfecting. Health Officer Bayles is of the opinion that sprinkling two or three times a day in and about houses infected with yellow fever would have a very beneficial effect in checking the spread of the disease.

How to Kill Flies.

The *Louisville Commercial* states how a prominent druggist of Louisville hit on a novel scheme to get rid of the troublesome insect: "Bodine, a druggist in Louisville, runs a soda fountain, and everybody knows how the flies are attracted by the sirups, etc. The druggist was almost in despair at the swarms of these buzzing pests which made their rendezvous at his store. He dared not use the insect powder in the ordinary way, and the fly paper was too filthy to be considered. In the midst of his dilemma he accidentally discovered that the insect powder is of almost as rapid combustion as gunpowder, though the flame lives several seconds. By a further investigation he discovered that a portion of the powder, thrown from the bellows through the flame of a lighted match held six inches away, produced the required flame, and was capable of destroying flies by the million. He, therefore, puts out some bait for them every morning. When they have collected in sufficient numbers, he gets his powder and match, and the work of destruction is sure and swift. No guilty fly escapes the scorching of the wings. By this means all the flies in the store can be destroyed in a few minutes, and their flayed remains are dumped into the street by the gallon. In the same paper we are told that other soda fountain men have adopted the idea, and say it works like a charm."

A SYSTEM TO HEAT WALLS OF BUILDINGS.

An invention designed to obviate the discomforts and difficulties arising from cold and damp walls, by heating the walls themselves, and thus transmitting the



PARKER'S MURAL HEATING SYSTEM.

greater portion of the required heat to the air in the building, is illustrated herewith, and has been patented by Mr. John D. Parker, of Fort Riley, Kan. A series of flues or ducts are formed in the walls and communicate with the furnace in the lower part of the building, as shown in Fig. 1, the flues being carried around the apartments in the different stories in the body of the wall, as shown in Fig. 2. Grates are also placed in the various apartments to regulate the temperature, the greater portion of the heat being supplied by the wall flues and the remainder furnished by the grates. The several flues are arranged in series, so that the heated air passes from the furnace to the horizontal flues of the first floor, and after passing entirely around the first floor it passes through vertical flues to the second floor, thence around that floor and upward, and so on throughout all the stories of the building, at last discharging into the apartments of the upper floor.

AN IMPROVED TRICYCLE.

A tricycle designed to be easily operated and guided is illustrated herewith, and has been patented by Mr. Patrick Gallagher, of No. 145 East Forty-second Street, New York City. It has a light but strong iron framework, and is propelled by means of a crank handle mounted in arms adjustably pivoted to uprights on the frame, one of the ends of the crank handle having a sprocket wheel connected by an endless chain with a sprocket wheel on the axle of the driving wheels, while the other end of the crank handle has a fly wheel to steady the motion of the machine, and so that but little exertion will be required to run it after a high

GALLAGHER'S TRICYCLE.

degree of momentum has been obtained. By removing or adding links in the chain, and the adjustment of the arms of the crank handle in the uprights, the machine is readily made easy of operation by persons with long or short arms. The guide wheel has its bearings in a fork having a post extending through bracket arms, and is adapted to be readily turned by a conveniently located foot board, the lever of a suitable braking mechanism extending up at one side of the seat.

Do Tools Grow Tired?

It is a common complaint among mechanics that their tools do not serve them as well some days as others.

A correspondent of the *Iron Industry Gazette* says: Tools, like men, grow tired. I have seen a first class chisel get tired and act as though it was possessed of the King of Sheol. It would not keep its edge, and the more I sharpened it, the sooner it would lose its edge.

I called the attention of a shopmate, a grizzled old veteran, to the peculiar behavior of the chisel. He looked it over and handed it back to me, saying: "The tool is all right, only a little tired. Lay it away and let it rest. It will come out all right again, just like a man who is tired." I did not believe the old fellow, and I really thought he was crazy to talk of a tool getting "tired," but as there was no help for it, the tool was laid away. I do not remember how long it was left to rest, but when it was again sharpened and used it appeared to hold its keenest edge as well as it did before it got tired. Barbers tell me their razors in constant use get tired in the same way, and woodchoppers say their axes sometimes seem to get soft all at once. Possibly constant and hard usage may cause changes in crystallization that would account satisfactorily for the peculiarity alluded to. Locomotive engineers often observe peculiar misbehavior in their machines, which may possibly be the result of continued heating, friction, and pounding. When a tool gets "tired," or a machine "balky," give each a rest.

[THE SWISS CROSS.]

Amber.

The only place in which amber has been found in paying quantities is in the Baltic Sea, and the vein extends from western Russia to Denmark, Norway, and Sweden. In former years the production of amber depended principally upon the storms occurring in the winter time, for when the sea was convulsed the amber lying on the bottom was thrown up on the shore; but human enterprise stimulated by the demand for the article has changed all this, and for the last twenty-five years various engineering appliances have been used for getting out the amber in the quickest and cheapest way.

The most profitable strata have been found in the Courischer Haaf, which is located in the vicinity of Memel, and there are twenty large dredging boats constantly at work day and night for eight months in the year. There are large strings of iron pails that are constantly dragging along the bottom of the sea, and bringing up the sand and what amber there may be in it. This is emptied on the deck of the ship, and there it is washed, and the amber picked out from among the sand and stone.

The little village where this industry is carried on is called Schwartzort. It is situated on a narrow strip of land that extends about ten miles beyond the mainland, and is perhaps a mile wide at its widest part. At one time this strip of land was covered with a forest, but the wood was sold off by a Prussian king in the beginning of this century to the Russians. The land has become barren since stripped of its sheltering forest, and now it is nothing but a sandy waste; and, were it not for the amber industry, this beautiful peninsula would be desolate. About ninety miles further west is another little village, called Palmnicken, and here the amber is obtained in an entirely different manner. The most approved diving apparatus is used, and the divers go out in rowboats, each of which is fitted with an air pump. They go down into the sea, where some of them remain as long as four or five hours. Each diver has a little bag around his neck, and a peculiar hook, with which he pulls up sand, and every piece of amber that he finds is thrown into his bag. An encouragement to the diver is that if he finds a piece of amber he is entitled to a prize of ten, twenty-five, or fifty cents, according to the size.

While the divers are below in the sea, engaged in hunting for the amber, the miners are just as busy on land, for it seems that the same stratum of the green-sand runs, perhaps for thirty miles or more, into the land. The opening of the mine is perhaps a thousand feet from the shore, and it is necessary to go down about one hundred and fifty feet, which is some thirty or forty feet below the level of the sea. To keep the mine as dry as possible, there are several pumps working day and night; and to prevent the earth from falling in, the passages are propped up by logs of wood. There are about forty miles of passageway in these mines, and there are about seven hundred men employed for the various departments. As soon as a passageway is opened, a track is laid, and on this track there runs a little truck, which holds perhaps half a ton of sand. The miners simply cut out the sand and fill the truck. It is then brought to the surface, where the whole contents is thrown into a long trough filled with rushing water, which separates the sand from the amber, which is caught by nets of various sizes. The amber is then cleaned by machinery, and assorted according to its quality and purity. The writer believes himself to be the first American who ever went down into the amber mine.

F. R. KALDENBERG.

Keeping Tools.

Keep your tools handy and in good condition, remarks the *Manufacturer and Builder*. This applies everywhere, and in every place, from the smallest shop to the greatest mechanical establishment in the world. Every tool should have its exact place, and should be always kept there when not in use.

Having a chest or any receptacle, with a lot of tools thrown into it promiscuously, is just as bad as putting the notes into an organ without regard to their proper place. If a man wants a wrench, chisel, or hammer, it's somewhere in the box or chest, or somewhere else, and the search begins. Sometimes it is found, perhaps sharp, perhaps dull, may be broken, and by the time it is found he has spent time enough to pay for several tools of the kind wanted.

That habit of throwing every tool down, anyhow, in any way, or any place, is one of the most detestable habits a man can possibly get into. It is only a matter of habit to correct this. Make it an inflexible end of your life to have "A place for everything and everything in its place."

It may take a moment more to lay a tool up carefully after using, but the time is more than equalized when you want to use it again, and so it is time saved. Habits, either good or bad, go a long way in their influence on men's lives, and it is far better to establish and firmly maintain a good habit, even though that habit has no special bearing on the moral character; yet all habits have their influence.

Keeping tools in good order, and ready to use, is as necessary as keeping them in the proper place. To take up a dull saw or dull chisel, and try to do any any kind of work with it, is worse than pulling a boat with a broom, and it all comes from just the same source as throwing down tools carelessly—habit. Nothing more nor less. To say you have no time to sharpen is worse than outright lying, for if you have time to use a dull tool, you have time to put it in good order.

Explorations of the Gulf Stream.

The report for 1886 of the U. S. Coast and Geodetic Survey contains, in Appendix No. 11, a report of new explorations of the Gulf Stream, illustrated with maps, by Lieut. J. E. Pillsbury, U. S. N., which closes with the following conclusions:

I have to submit the following summary of my conclusions, based upon the information obtained during the two seasons' observations. The examination of the Gulf Stream currents having been made in March, April, May, and June, the conclusions may be incorrect for other seasons of the year, although there are no good reasons for supposing that such is the case except, possibly, in the amount of the variations.

1. Between Fowey Rocks, Florida, and Gun Cay, Bahamas, the current varies daily in velocity, at times as much as 2½ knots.

The greatest velocity is generally about nine hours before the upper transit of the moon. The variations are most excessive on the west side of the straits, and least on the east side.

2. The average daily currents vary during the month, the strongest set coming a day or two after the greatest declination of the moon.

3. The axis of the Gulf Stream, or the position of the strongest surface flow in passing this point, is 11½ miles east of Fowey Rocks lighthouse. The strongest surface current found here was 5¼ knots per hour; the least, 1¾ knots; and the average, $3\frac{6}{10}$ knots. The average current at other places on either side of the axis is as follows:

	Knots.
Axis of the stream, 11¼ miles from Fowey Rocks	3·6
3½ miles west, or 8 miles from Fowey Rocks	2·6
3½ miles east, or 15 miles from Fowey Rocks	3·2
10 miles east, or 22 miles from Fowey Rocks	2·6
17 miles east, or 29 miles from Fowey Rocks	2·4
24 miles east, or 36 miles from Fowey Rocks	1·8

4. The wind probably retards or accelerates the velocity of the current. A northeast gale in the Atlantic will probably "break up" the water of the stream, lowering its velocity materially, and afterward the flow will, by the reaction, be greatly increased over the normal speed. There is no evidence of any change in position of the axis of the stream due to the wind.

5. Two days' observations off Jupiter Light, Florida, indicate the same daily variation as was found off Fowey Rocks, and the axis of the stream at this section is probably about 17 miles east of the light.

The Size of the Spider's Thread.

I have often compared the size of the thread spun by full-grown spiders with a hair of my beard. For this purpose I placed the thickest part of the hair before the microscope, and from the most accurate judgment I could form, more than a hundred of such threads placed side by side could not equal the diameter of one such hair. If, then, we suppose such a hair to be of a round form, it follows that ten thousand of the threads spun by the full-grown spider, when taken together, will not be equal in substance to the size of a single hair.—*Leuwenhoek.*

North Atlantic Icebergs.

Icebergs are a great source of danger to transatlantic navigation from March to August every year. This is the season in which the expected proximity of these dread masses of ice demands from the mariner an increased vigilance. Sometimes, but very seldom, bergs have been fallen in with much earlier. On New Year's day, 1844, a berg was passed by the Sully in 45 N. 48 W., and this year, on January 3, one was reported in almost the same position. The northern ice barrier is broken up by the increasing power of the sun's rays as he travels northward along the ecliptic. Fields of ice, sometimes having an area of one hundred square miles, are detached, and a free exit afforded for the imprisoned icebergs. Icebergs and field ice are borne to the southward by the cold current that follows the bend of the land from Labrador to Florida. Field ice is formed on the sea surface during the Arctic winter, but bergs have their origin far inland, and are the growth of years. Greenland glaciers glide gradually down their gentle slopes into the sea, and the upward pressure of the water breaks off their snouts to form the icebergs of the North Atlantic. Some hardy Norwegians are about to cross Greenland, and intend to make a special study of the movement of the coast glaciers and this setting afloat of bergs. Ancient glaciers have written their story on the mountains of Great Britain, and bergs were formed a little way off the west coast of Ireland during the glacial epoch.

There exists a marked difference in form between the bergs of the two hemispheres. Arctic bergs are of irregular shape, with lofty pinnacles, cloud-capped towers, and glittering domes; whereas the southern bergs are flat-topped and solid-looking. The former reach the sea by narrow fiords, but the formation of the latter is more regular. It is well to give these splendid specimens of Nature's handwork a wide berth, for they frequently turn somersaults, owing to the wasting away of their immersed portions. Immense pieces of ice fell from a berg on to the deck of a ship that had approached too close to it while in this transitory state, carrying away her masts and maiming some of the crew. Again, ships have been sunk by colliding with submerged portions of bergs, extending from their visible volume like reefs of rocks from a bold sea coast. Hayes compared one that he saw to the Colossus of Rhodes. His ship could have sailed under the arch of ice formed in the heart of the berg.

North Atlantic bergs are neither so large nor so numerous as those met with in the Southern Ocean, between the Falkland Islands and the Cape of Good Hope. In 1854–55 an enormous ice island was drifting in about 32 S. 24 W. for several months, and was passed by many ships. It was 300 feet high, 60 miles long, and 40 miles wide, and was in shape like a horseshoe. Its two sides inclosed a sheltered bay measuring 40 miles across! A large emigrant ship, the Guiding Star, sailed into this icy bay and was lost with all hands. A similar, but smaller, mass of ice was met with in the North Atlantic by the Agra. She ran into a bay formed in the center of an iceberg, in 42 N., which was 1½ miles across, and she experienced great difficulty in beating out again.

A cubic foot of ice weighs about 930 ounces, but the same volume of sea water weighs 1,280 ounces. Hence ice floats on water, and but one ninth of the volume of a berg is exposed to view. There are several well-authenticated instances of bergs one thousand feet high having been sighted in the Southern Ocean, so that this would give the total height of them as about nine thousand feet!—a fairly good sized mass of solid water. In May, last year, the Inchgreen passed close alongside of a berg that Captain Miller estimated had an altitude of seven hundred feet above the sea surface, and was seven miles long. Bergs have often been seen grounded on the banks of Newfoundland where the deep sea lead gave a depth of 650 feet. Ross saw several stranded in Baffin's Bay where the depth was 1,400 feet.

Bergs are unusually numerous in some years, and a connection is said to have been traced between the frequency of bergs in the North Atlantic and the low temperature in our islands during the summers of some years. The ship Swanton passed three hundred bergs in 1842 in 43 N. 50 W. She narrowly escaped destruction during the night, as she passed between two huge bergs that almost grazed her sides. Captain (afterward Rev. Dr.) Scoresby, while whaling in the northern icy sea, counted no less than five hundred bergs under way for the open waters of the Atlantic. Last June the steamship Concordia passed seventy-eight large bergs in a short space of time, as they lay aground in the Straits of Belleisle. This year the ice is both late and scarce. In 1883 it was very abundant. No forecast can be made as to the probability of frequency of bergs. A vessel has been so firmly fixed in the ice in the month of March in 44 N. 45 W. that her master was able to take a stroll on the ice. In 1841 several ships, stopped by ice in mid-Atlantic, availed themselves of the opportunity to kill some seals that were basking upon it.

Bergs have been seen in the North Atlantic laden with lumps of rock, sand, and soil. The banks of Newfoundland would appear to have been formed in this way. Arctic lands suffer denudation by the inland ice as it creeps along toward the sea, and the bergs, separated from their parent glaciers, deposit the fragments at the bottom of the old ocean, there to harden into rocks and help in moulding the surface of the coast. Nothing is lost, nothing is new. In August, 1827, a berg was observed stranded in eighty-five fathoms in 46½ N. 45 W. Much earth and rock were embedded in its fissured sides. Polar bears and other Arctic animals were seen on the bergs of 1883. An abandoned ship was passed high and dry on a huge ice island in 1794, and a ship with her crew was seen similarly situated in 1845; but no help could be afforded.

On April 21, 1851, the brig Renovation passed an immense ice island, about ninety miles to the eastward of St. John's, Newfoundland. Two dismantled ships lay snugly upon it, but there was no sign of life. Captain Ommanney, R.N., was deputed to investigate this report, and took great pains to arrive at its truth, as it was inferred that these ships were the Erebus and Terror, of Sir John's Franklin's ill-fated expedition. Some people are still of the same way of thinking. The crew of the German discovery ship Hansa were compelled to abandon their vessel, crushed by ice, and took refuge on an immense floating mass of ice, where they remained for eight months. Their floating ice island was seven miles in circumference, and drifted south, until the poor fellows were able to make their escape. During this time they had lived in a hut constructed from the coal saved from their ship. H.M.S. Resolute was abandoned, embedded in the ice, but was picked up after a long drift southward. This ice-bearing current tends to make the American coast very cold, and, as we write, Sydney, C. B., is not yet open to navigation, although it is 7 degrees further south than Liverpool. The warmer water of the Gulf Stream, on the other hand, enables the whalers to get far to the northward, on this side of the Atlantic, and makes the mean temperature of Ireland in 53 degrees N. as high as that of American coast ports in 38 degrees N., 14 degrees nearer to the equator.

Many losses and casualties were caused by the ice in the North Atlantic last season. Masters should take frequent observations of the temperature of the sea, although it must not be relied upon as a specific indication. Warning may often be obtained by means of the echo given off from a berg when a steam whistle is sounded. No precaution must be neglected by those who navigate our floating palaces and ocean tramps, but the safest plan is to adopt a southerly route clear of bergs. The Etruria has followed this course in her fastest passages. Our Admiralty charts show the seasonable limits of bergs, and the United States Hydrographical Office issues charts every month giving the exact position of each berg up to the moment of going to press. Notices of bergs passed at sea should be forwarded to Washington immediately on arrival, and every berg reported to us will receive due publicity in our columns.—*Liverpool Journal of Commerce.*

The Growth of Luxury.

Prosperity encourages luxury; luxury is enervating, and encourages sloth; luxury tends to produce, and in the world's history has often produced, national decay. Now, the growth of luxury for the last half century has been very great and very general. We do not merely mean that the rate of living has advanced. This of itself is not necessarily to be deplored in any class, and in some classes is a matter for serious congratulation. That an agricultural laborer, for instance, should be able to procure more food, better clothing, better housing, and better education for his children than he could fifty years ago is a matter to rejoice over, and a state of things to secure by every proper means. What we mean is, that the scale of comfort deemed necessary by every class has enormously grown. And the tendency is ever upward. Young men beginning life try to start where their fathers left off. Some quarter of a century ago there was a discussion in the newspapers as to the prudence or otherwise of young persons in the upper classes marrying on an income of three hundred a year. Three times that income would be now considered inadequate by the critics who conducted the discussion. —*Quarterly Review.*

A New Nut Gall Ink.

According to the *Droguisten Zeitung*, an excellent (*ausgezeichnete*) ink is the result of the following formula:

Take of—

Powdered gall nuts	16 parts.
Gum arabic	8 parts.
Cloves in powder	1 part.
Sulphate of iron	10 parts.

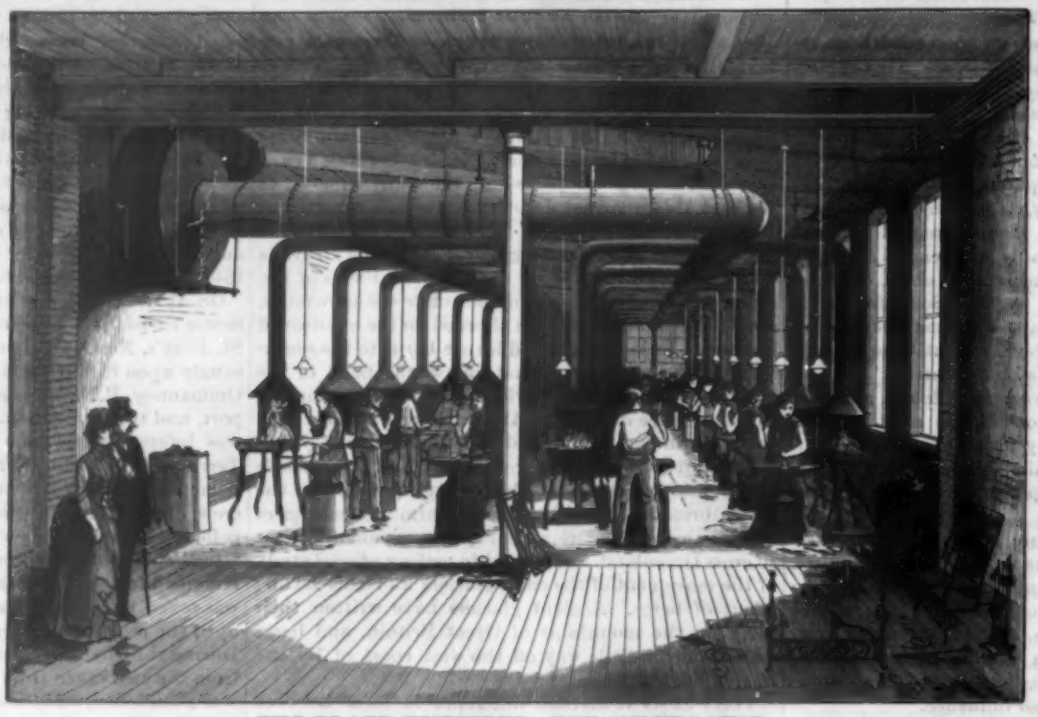
Place in an earthen or glass vessel and add 100 parts of rain water, and let stand for eight to fourteen days, with frequent agitations. At the expiration of the time mentioned decant for use. *Der Pharmaceut* suggests that, good as the ink may be made after the above formula, it is improved by the addition of from 2 to 6 parts of Campeachy wood. One great advantage of this ink is that it can be thinned with water at any time without injury, and that it can be converted into a copying ink by the addition of 4 parts of glucose.

PRATT INSTITUTE, BROOKLYN, N. Y.

(*Continued from page* 211.)

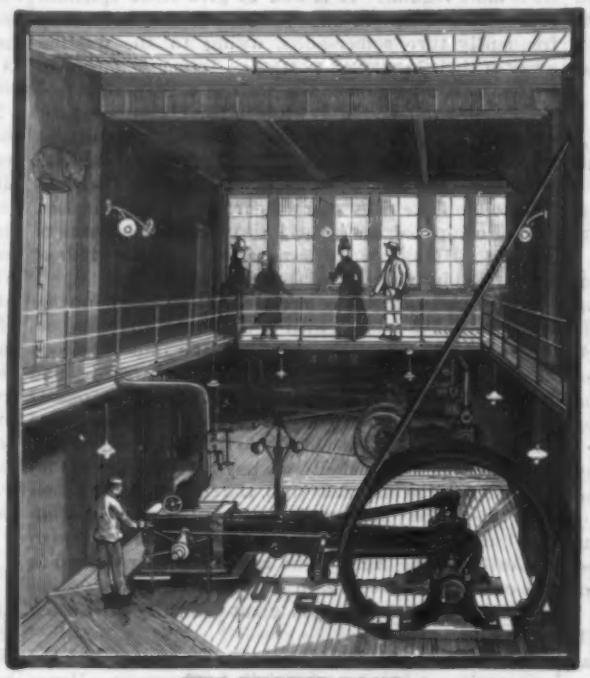
In front of the cooking rooms is a lunch room, where a simple meal well served is furnished at noon and at evening for a small sum. This is intended particularly for the teachers and students connected with the Institute. Communicating with the lunch room is a well equipped kitchen where the meals will be prepared for the lunch room on this floor and also for the large lunch room soon to be placed in the basement of the main building.

The department of mechanic arts is designed for the instruction of three classes of pupils. First, members of the regular three years' course, who, in connection with their studies, science, mathematics, language, and drawing, will be given courses in wood and iron work, joinery, pattern making, wood turning, moulding, casting, forging, etc. For the girl students in this course, decorative work in wood and metals, cooking, sewing, dressmaking, etc., will be substituted for advanced shop work. Second, pupils from other schools who wish to supplement their studies with manual work. Third, those who are employed during the day, but wish to utilize their evenings in acquiring a thorough knowledge of the methods and processes of the industrial arts.



THE PRATT INSTITUTE. THE SMITH'S SHOP.

The buildings devoted to this department cover a ground space of 250×100 feet. They are of substantial construction, of brick with bluestone trimmings, and vary in height from one to four stories. A bridge from the third story connects these buildings with the second story of the main building. The basement contains two boilers of 100 horse power each, which furnish steam for heating all the buildings, and supply power for the engines, elevators, electric lights, fire pump, etc. In the engine room adjoining the boiler room is a fine Harris-Corliss engine of 40 horse power for operating the machinery of the institution, and an Armington & Sims high-speed engine, which drives an Edison dynamo for supplying the incandescent lamps in the main building. An 800 light Sawyer-Man dynamo and an arc machine of the Western Electric Co.'s system supply the shops and trade school buildings with light. Both of these machines are driven by a 125 H. P. engine from the N. Y. Safety Steam Power Co. The remainder of the basement of the buildings of this department is used for storage. On the first floor is the smith shop, a room 73×29 feet, and 18 feet high, provided with ventilating skylights. The room is furnished with forges and anvils, and is planned to accommodate twenty-five pupils. Pipes laid under the floor carry the blast of the forges, and an exhaust fan takes away the fumes and smoke. In this department the forging of tools and various kinds of iron work, including art forgings, is carried on.



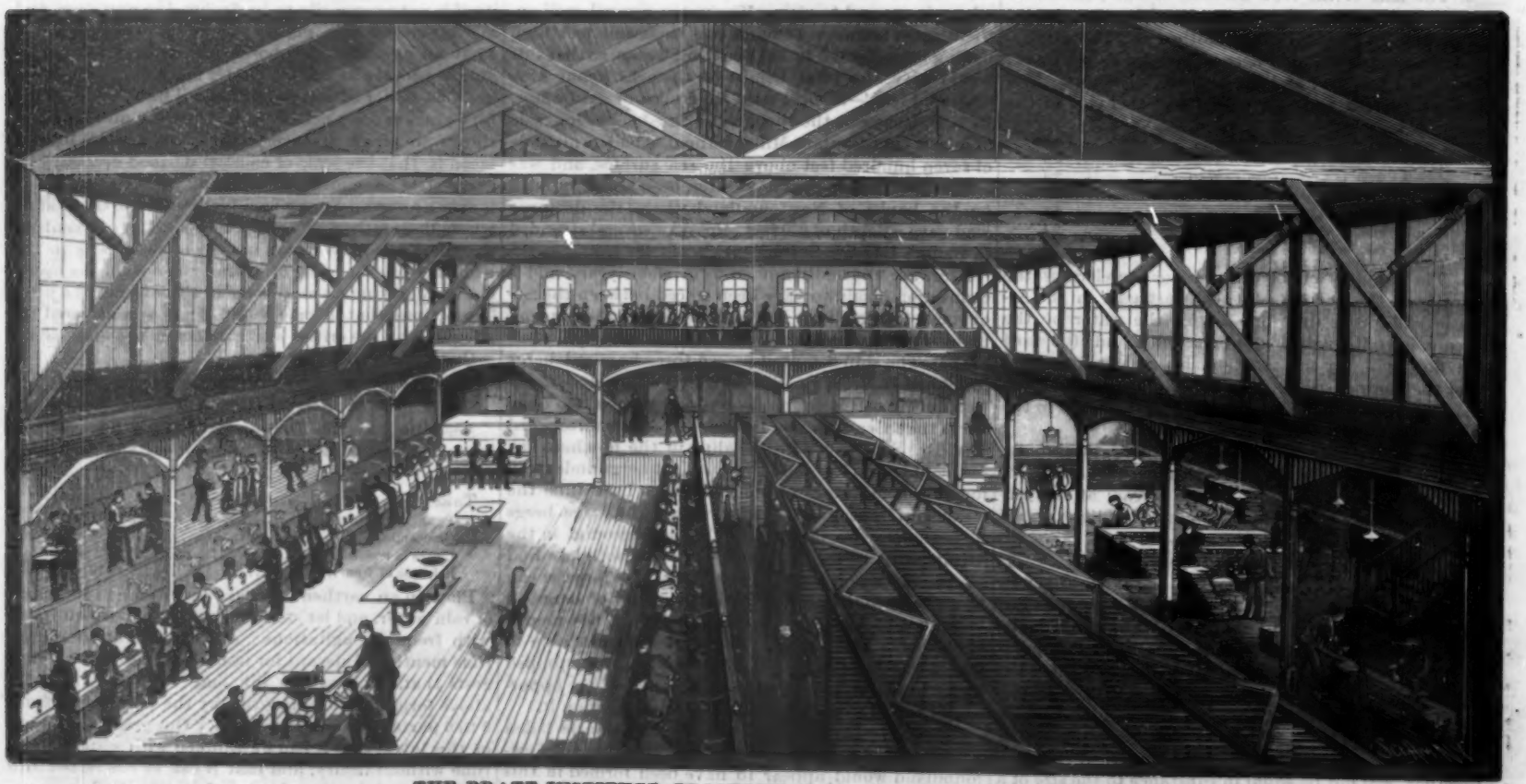
THE ENGINE ROOM.

Adjoining the smith shop is the foundry, 66 by 29 feet, with an 18 foot ceiling, provided with two skylights. The foundry equipment includes a 20 inch iron melting cupola, two brass furnaces, a white metal gas furnace, and core oven. Practice is given in green sand, dry sand, and loam moulding, and in core making. Swept-up work is illustrated, and particular attention given to the production of art castings in iron and bronze. Upon the same floor is the machine shop, which is fitted with benches with sufficient room for forty-eight pupils to work at the vise. It is furnished with a full complement of engine lathes, drilling machines, and planers, being, in fact, a fully equipped machine shop.

The wood-working department, which occupies the second floor of the same building, is provided with 150 feet of wall benches and 36 single benches, all supplied with the latest and most approved wood-working tools. The floor also contains a number of wood-turning lathes, a large pattern making lathe, a buzz planer, a surfacer, and circular and scroll saws. Adjoining the wood-working department is a lumber and tool room for the storage of tools and lumber used in the wood-working shop.

The third floor of this building is devoted to laboratories and class rooms, and the fourth to advanced art work in metals, engravings, etc. This last department is not yet organized.

The department of building trades, occupying the remaining buildings of the Institute, is designed for the instruction of pupils in bricklaying, modeling, stone carving, the building of frame buildings, plumbing, etc. In bricklaying, the pupils are first taught to handle the trowel and spread the mortar properly; they are then put to work upon 8 inch walls until they can carry the corners plumb and lay the courses level. Proper care is taken that the joints should be thoroughly struck and pointed. When the student can do this perfectly, he is taught the construction of arches and ornamental brick work. In stone carving the pupils are taught to work out forms illustrating the different styles of orna-

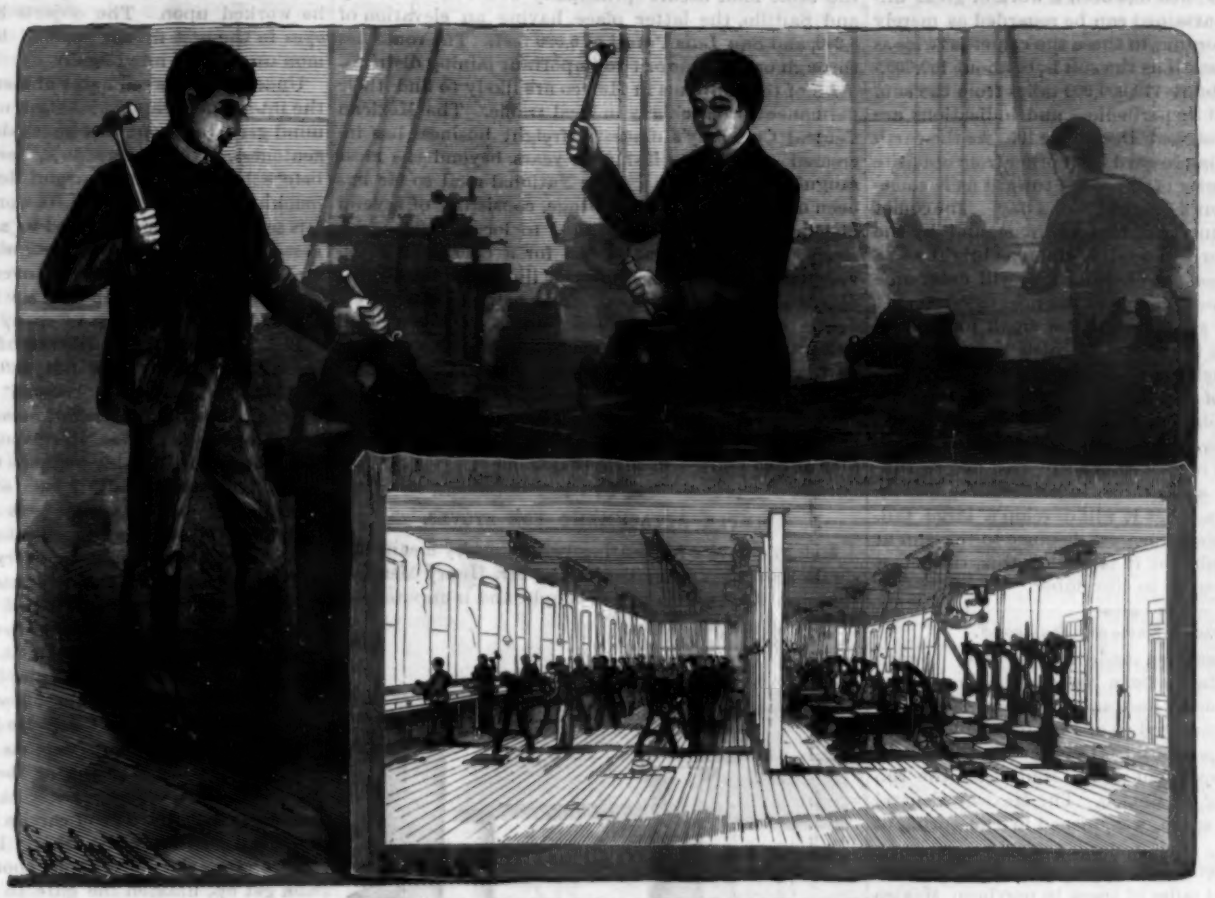


THE PRATT INSTITUTE BROOKLYN N. Y.—THE TRADES SCHOOL.

ment in architecture. All the students are required to sketch their designs and model them in clay before cutting them in stone.

The plumbing section can accommodate 54 pupils, all of the necessary tools and benches being provided for carrying on the work in the most approved manner. The course of study includes the making of lead seams, all kinds of wiped joints, and sand bends. Instruction is also given in the working of sheet metal, in the erection of sewer pipes, etc. The instructions in plumbing amount to a course in sanitary engineering, as the principles of drainage, sewerage, and ventilation are thoroughly considered.

A department of electrical engineering is soon to be inaugurated. This will afford to students of electricity rare opportunity to perfect themselves in this science. Other departments will be added from time to time, as circumstances may require.



THE PRATT INSTITUTE—THE MACHINE SHOP.

Our engravings truthfully represent many of the departments of this great institution, and give an excellent idea of the activity prevailing there. There is no longer an excuse for artists or artisans or students of the fine or mechanic arts for lack of proficiency in their particular departments, for persons without some ability cannot enter this institution, and when once entered they are taken in hand by a corps of competent professors and teachers, who will carry them forward rapidly and thoroughly through the various courses of study, enabling them to graduate with honor to themselves and credit to the institution. In bestowing this great gift upon the public in the prime of his life, Mr. Pratt has enriched the world with something more valuable than gold or silver. He has set an example which might be followed by other wealthy men to the great benefit of the country at large. Such institutions elevate the dignity of labor, raise the tone of society, improve the quality of work, and contribute to the happiness and comfort of wage earners.

Man's War with Creeping Things.

The Philadelphia *Inquirer* asks: What shall be done with the pests? What brings them? How shall they be exterminated? Year by year they seem to increase. More locusts, more grasshoppers, more chinch bugs, more potato bugs, more cut worms, more weevil, more mosquitoes, more flies, more what not? In the struggle to maintain our lordship over all creeping and crawling things we are already having to resort to desperate remedies. In Illinois the farmers of several counties have resolved not to raise any wheat, barley, or rye for three years in order to starve out the chinch bugs. This looks almost like a victory for the chinch bugs, and it becomes an interesting question, moreover, whether such a lockout would exterminate them; whether they could not worry along without wheat, barley, and rye for three years about as well as the farmers by changing their diet to something else. It is evident that man has a great deal to learn yet. He has to learn how to till the earth so that it will yield up more grain and less bugs. The pests would appear to represent a vast amount of misdirected energy. If the inventive mind of man can discover some way to make the life and energy of the pests materialize in the shape of wheat, barley, rye, potatoes, etc., his crops would be immense.

AN ELECTRIC CARRIAGE.

Trial was made recently at the skating rink, St. Paul's Road, Camden Town, of an electric dog cart, built by Messrs. Immisch, of London, for the Sultan of Turkey. In appearance the vehicle does not differ from an ordinary four-wheeled dog cart with the shafts removed, and in this respect the design is perhaps open to criticism, as something might have been done to take off the uncompromising squareness presented by the splash board, and so give the appearance of a carriage specially adapted for the new mode of propulsion. The motor, which is placed in the center of the body of the vehicle, is of Messrs. Immisch & Co.'s 1 horse power type, a current of 20 amperes with an electromotive force of 48 volts being used. Motion is communicated to one of the hind wheels by means of a small pinion on the main shaft of the motor working into a pitch chain, which passes over a series L shaped plates attached at intervals to the inner face of the rim of the wheel, so as to constitute in effect a driving pulley for the pitched chain to act upon. It was stated that the motor could be reversed so as to back the vehicle. The power is stored in twenty-four small accumulators of special type, occupying the space under the seats, and said to be sufficient to propel the vehicle at a speed of about ten miles per hour for five hours; but at the trial nothing more than a few runs round the rink was attempted, sufficient to afford the visitors present the opportunity of having a ride, and no great speed could be attained, on account of the confined space and the consequent necessity for frequent sharp turns. The steering is effected by a shaft projecting through the footboard, and furnished with a hand-wheel. On the lower end of the shaft is a pinion which takes into a ring of teeth on the fore carriage. The brake is actuated by a lever, placed in a convenient position for the driver's foot, and the switch for turning on the power is attached to the splash board. The total weight of the vehicle, all complete, is about 11 cwt., the accumulators weighing about 7 cwt. The carriage appeared to run very smoothly, and to be under perfect control, although the operation of backing was not shown during the time of our visit.—*The Engineer.*

AN ELECTRIC CARRIAGE.

Colored Leather.

Modern leather manufacturers, says the *Shoe and Leather Reporter*, are surpassing the ancients in the diversity and beauty of the colors they are introducing. Many of the shades produced in upper leather are highly attractive. The Thebans were thought to have attained great proficiency in this art, but the variety of colors they are credited with was meager compared with the iridescent display of our epoch. Remnants of leather found in Theban tombs reveal the use of acacia and other trees in the tanning process. The Jews, after the exodus, probably put into practice the knowledge obtained of this art under the Pharaohs, in preparing rams' skins dyed red for the service of the Tabernacle.

The love of colors is as old as the human race. The art of dyeing leather, so long practiced on the Mediterranean, was afterward attained with difficulty by other European countries. But we need no longer to go to Egypt or the Mediterranean for instruction concerning it.

Prof. Barnard's Comet.

Prof. Lewis Boss, of the Dudley Observatory, has completed calculations of the orbit of the new comet discovered by Prof. Barnard at the Lick Observatory, September 2. Having remained nearly stationary, the determination of its path has been a work of great difficulty, and results attained can be regarded as merely approximate. According to these the comet is twice as far away from the earth as the sun is, or about 190,000,000 miles, and is about 170,000,000 miles from the sun. It is moving toward its perihelion, and indications are that this will be reached December 10. As the earth and comet are moving toward each other from opposite directions, the velocity of approach toward us is something unusual, about 3,000,000 miles a day. The comet will consequently increase in brightness, and by the middle of November will be sixty times as bright as at its discovery. Subsequent calculations will determine whether it will become visible to the unassisted eye. It came into our solar system with the small inclination of fifteen degrees to the plane in which the planetary orbits lie, and in such a way as to move in a direction contrary to that of the planets. The comet cannot readily be seen much earlier than 1 o'clock in the morning, but within a month it will be visible in the early evening hours, and in November will rise before sunset. The physical appearance indicates that it is intrinsically bright and that it will develop a large tail. Calculations indicate its nearest distance to the sun at 125,000,000 miles. Should it fall below this, the comet will be a brilliant object in November.

The Mexican National Railroad.

Rapid progress has been made this summer toward the completion of the Mexican National Railroad Company's "International" line, and President Raoul informs us that it is expected to open it for traffic before November 1, and possibly by October 15. This will make a second independent all-rail route from the Rio Grande to the city of Mexico. The Mexican Central road, from El Paso south, was opened in the spring of 1884.

At the close of 1883 the Mexican National Company had in operation 444 miles of track in northern Mexico and Texas, and 356 miles extending west and north from the city of Mexico. Owing to financial difficulties construction had been suspended, with a gap of 352 miles, lying between Saltillo, in the southern part of the State of Coahuila, and San Miguel, in the State of Guanajuato, to be finished in order to complete the connection between the capital of Mexico and the United States. In 1884 the original Mexican National Railway Company defaulted on its first mortgage bonds, and, pending a reorganization, no further building was possible. Toward the close of 1886 an agreement was entered into by the leading representatives of the first mortgage bondholders on the one hand and the Mexican National Construction Company and other creditors on the other, in accordance with which the present Mexican National Railroad Company was formed.

By the terms of the new agreement the Interoceanic line, running from the city of Mexico directly west 274 miles to the present terminus at Patzcuaro, and the International line, completed and uncompleted, from Acambaro on the former, 177 miles west of Mexico, north to Laredo, together with some minor pieces of track, were turned over to the new corporation. Possession was taken in July, 1887, and during the next month contracts were executed for the completion of the missing link in the International division. Work began at the northern end in October and at the southern end in December, and the builders are obligated to finish their task by October 1. Extensive machine shops are to be put up at Laredo, the Pullman Company has supplied a lot of sleeping and dining cars, and the new route will open with fair prospects for both passenger and freight traffic.

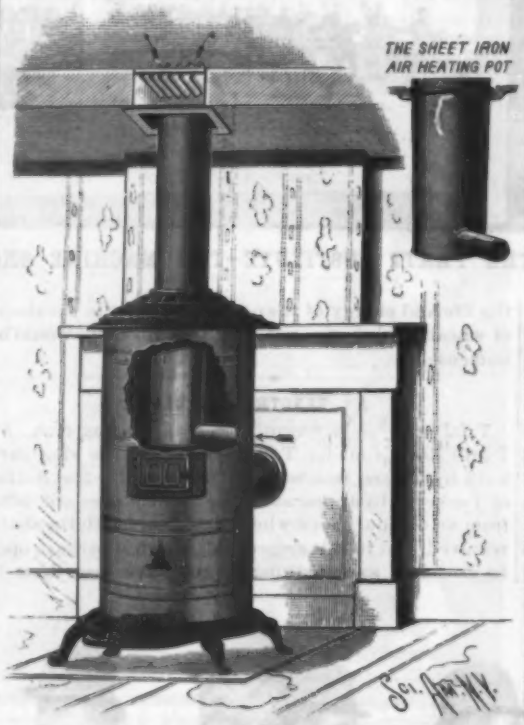
Taking St. Louis for the starting point, the distance from the principal cities of the United States to the city of Mexico by way of Laredo and the Mexican National route will be 1,905 miles, as against 2,585 miles via El Paso and the Mexican Central Railroad. The distance from St. Louis to Laredo is about 1,080 miles, from Laredo to Mexico 825 miles. From St. Louis to El Paso it is 1,360 miles, and from El Paso to Mexico 1,225 miles. The saving of 680 miles by the new line is equivalent to nearly thirty hours' time for passenger travel and the mails. The route offers superior attractions for tourists, crossing the Sierra Madre Mountains west of the city of Mexico at an elevation of 10,180 feet, or little less than two miles above the sea. The vertical ascent from the capital is 3,700 feet, most of it in a distance of sixteen miles. That part of northern Mexico traversed by the National road also compares favorably in interest with the Mexican Central's unattractive territory. The Central route, however, possesses an advantage in that it passes through half a dozen interesting cities, while the only cities of importance on the National road are Monterey, San Luis Potosi, and Toluca. The National is a narrow gauge, and the Central a broad gauge road.

The new line going south from Laredo crosses the northeast corner of the State of Coahuila, the western part of Nuevo Leon, the southeast corner of Coahuila, the center of San Luis Potosi, the center of Guanajuato, the northeast corner of Michoacan, and the northern part of Mexico. The ascent from the Rio Grande to the table land occurs principally between Monterey and Saltillo, the latter place having an elevation of 5,240, and San Luis Potosi of 6,000 feet. The route lies through or near one or two important mining districts.

All of the railroads in Mexico are likely to find their permanent profit chiefly in local traffic. The Mexican Central Company's domestic freight business has increased during the last four years beyond the most sanguine anticipations. The National road so far has been operated at a disadvantage, consisting of several disjointed sections and confined to local traffic exclusively. President Raoul looks for a considerable development of earnings after the line from the United States gets into operation. The new company's expenses so far have been heavy on account of needed betterments with a view to through business. Other narrow gauge enterprises to connect with the Mexican National are under way. All things considered, the outlook for this and the various other Mexican railroads appears to be brighter than at any time within the last four or five years.—*Bradstreet's.*

SIMPLE ATTACHMENT FOR STOVES.

A simple device for heating two rooms by means of a single stove has been devised by Mr. Henry Mead, of this city. As this idea is very simple, and is unpatented,



SIMPLE ATTACHMENT FOR STOVES.

it may be applied very easily to any stove in use. The purpose of the device illustrated is to utilize the heat space in stoves, which in ordinary cases is devoid of any use other than furthering the general exterior design and increasing the exterior heating surface, it not altering the outside appearance.

To accomplish this, the cover of the stove is removed, and a metal air heating chamber, having a slight flange near its upper edge, and a gas-tight bottom, is introduced. This pot or chamber should be so deep as to extend downward as far as can be done without interfering with the operations of feeding the coal to the fire. At or near the bottom of the chamber an air pipe of convenient size is fitted, and this extends to and through the side of the stove. Connection by pipe from the top of the pot to the register in the floor above completes the arrangement. Without additional fuel this plan has been found to furnish warmth enough in cold days to render needless any stove in the upper room.

The Herreshoffs as Ship Builders.

Charles Frederick Herreshoff, of Bristol, R. I., died of pulmonary disease at his home in that city, September 8, in the eightieth year of his age. Mr. Herreshoff was the father of the famous Herreshoffs, the boat builders, whose works, as a writer in the New York *Sun* shows, are about the most conspicuous thing left to remind Bristol of her trading days. The Herreshoff children played about the old ship yards. The Herreshoffs took to boats. Boats got into their blood more or less from both sides of the house. It wasn't strange, therefore, that John Herreshoff began whittling out boats as soon as he was old enough to manage a jackknife. In his fifteenth year he built a good sized craft for sailing on the bay.

Then he lost his sight. Gradually a film came over his eyes, and finally shut off forever the last dim glimpse of Bristol and her boats.

But he went on building boats just the same—not, of course, as if nothing had happened, for his methods of perception had to be radically changed. He had the task before him of carrying in his mind the models he worked upon. The objects he had seen with his eyes in the first fifteen years of his life he could summon up into his mind again.

Under the enforced habit of mental activity, without the interruption and suggestion of outside objects, his mind grew to be one of remarkable concentration and acuteness. He became able, for instance, to set up before himself, from a careful description, a piece of machinery, and to explain its workings and its faults. His sense of touch developed to a wonderful sensitiveness, too. He learned to recognize the power of lines by rubbing his fingers slowly over a marble, and how well he succeeded in finding the good and discarding the bad has been shown by many a craft.

But this was when Herreshoff was building only sailing vessels. It was not until after 1873, when Nathaniel Herreshoff became interested with his brother, that the Herreshoff steam vessels made their appearance. Mr. John Herreshoff had been thinking over the coil boiler idea for some time, and when it was applied to steam craft it was so successful that the building of sailing vessels was at once abandoned. The industry at once jumped into prominence, and the shops were used for making every part of the vessel.

The average individual who has heard of Herreshoff would very likely expect to find him industriously at work upon a model or laying down the lines in some ingenious way for a new boat. He will be found usually in business hours sitting behind a little railing in one of the rooms of the office, quietly resting one arm on a desk at his side. He is very busy—just as busy as if his eyesight were as good as an eagle's. Secretary Young is sitting at the desk by his side and reading letters, bills, orders, all kinds of business communications. Herreshoff carries them swiftly along in his mind, one after the other. If you should happen to drop into the office about noon, say, you would see him get up, unlatch the gate to the railing with perfect ease, walk to the hat rack where his hat is hanging, with two or three more, and take his down without a fumble.

Mr. Nathaniel G. Herreshoff, who is not blind like Mr. John and others in his family, is the designer. He works out the models, makes his calculations, etc. Mr. John may run his hands over the models, hear the measurements read, and make suggestions. The beauty and effectiveness of the Herreshoff models are thus due, in their conception, almost wholly to the two brothers. But there are experienced men in every branch of the business to take them up and develop them into the much admired Herreshoff yachts.

The steel yacht which the Herreshoffs are now building will be looked for with considerable interest. Her plates have been fitted to each other as smoothly as the tiles in a floor. She is 148 feet in length, with 18 foot breadth of beam, and a 7 foot draught. Her engines, also built by the Herreshoffs, are of quadruple expansion type, and are beauties of simplicity and strength, capable of 800 horse power. Her contract calls for 17 miles an hour. The interior will be a model of beauty and safety. The woodwork is of highly polished quartered oak, and there are five watertight bulkheads. She will cost Mr. Brown about $70,000 as she comes from the Herreshoff's hands.

Curious Minerals of Utah.

Included in the mineral resources of Utah, apart from its precious metals, are deposits of alum, some recently discovered veins of which are eighteen inches thick and several hundred feet in length, of dazzling whiteness and great purity. Beds of niter are also found sufficiently pure to readily fuse when thrown on hot coals.

Ozokerite or natural mineral wax, a rarity elsewhere, is here found in large quantities. It is air, acid, and water proof, and can be used for imparting these qualities to other substances. As an insulator it is said to be perfect, and would doubtless be found a superior insulating material for electrical appliances. It could also be adapted as the base of a cheap yet desirable paving material and for indurating piles and posts to prevent decay.

A somewhat similar discovery is gilsonite, found, on analysis, to contain about eighty per cent of carbon or asphalt in pure form.

Of the latter a vein has been discovered three feet wide and over a mile in length—a supply that, if worked, would be found almost inexhaustible.

As is now well known, the Great Salt Lake is an immense, limitless magazine of salt, that can be readily obtained in any desired quantity by the simple process of evaporation.

From this lake vast quantities of sulphate of soda are also secured, blown on shore at certain temperatures by the winds, where hundreds of tons are often piled up in a single night, that can be utilized in the cheap production of sal soda and carbonate of soda.

Stray Railroad Cars and How they are Recovered.

The way in which railroad officials keep track of their freight cars, which are run thousands of miles over other railroad lines, has, no doubt, excited the wonder of many, and were it not for the constant vigilance of the great railroad companies in keeping watch of their freight cars, the loss of rolling stock and damage resulting from delays and mistakes would prove a source of serious financial loss to all concerned.

Nearly all the great roads employ a corps of what are known as "lost car searchers" or "tracers." Every freight car is numbered and used for a certain purpose, and whether it be a "gondola" or flat open car, or a box car, it can be traced from one end of the country to the other. The "searchers" will follow a clew to San Francisco if necessary, and see that the car is returned to its proper station. The "car searcher" has been a most active agent of the railroads for many years past, but, as in every other business, improved methods are constantly introduced.

At last our great trunk line road, according to the *Evening Telegram*, has dispensed with the car searcher in favor of a large force of responsible clerks, with the telegraph and telephone as auxiliaries. So systematically is their work done that, if the conductor of a freight train were to make the slightest error in the numbers of the cars in his train or a description of them, it would be detected and the conductor called on to rectify it. If a car is reported missing in any part of the country, one of these clerks, by referring to his books, can tell at what point the particular car should be at the time and when it should be returned.

Artesian Well Boring in Nevada.

We learn from the *Mining Industry*, of Denver, that artesian well boring is now a sort of mania in parts of Nevada, and some of the borings are proving successful. A fine flowing well was struck a few days ago in Douglas County, Carson Valley, at a depth of only 310 feet, and without encountering rock of any kind. Improved boring machinery has been ordered from the East, and we may expect to see the experience gained in the Comstock mines, in "feeling ahead" for water, brought into play. By tunneling into the mountain that forms the rim of the basin of Lake Tahoe, a very large supply of water might be obtained, and as the diamond drill will easily bore ahead 1,000 feet or more, it would be an excellent tool for use in tunneling for water. In case of striking a strong flow, several holes could be sent into the source, thus saving the cost of driving forward a large tunnel. Many great bodies of water have been thus tapped and drawn off in the deep workings of the Comstock. In the Union Consolidated mine, cocks were fitted into the diamond drill holes and the water drawn off as it could be taken by the pumps. In running the Sutro tunnel the diamond drill was sent ahead to tap shafts in which water had accumulated to the depth of several hundred feet. Good hits were nearly always made with the drill, though it was sent ahead a great distance.

AN IMPROVED DOOR OR WINDOW STOP.

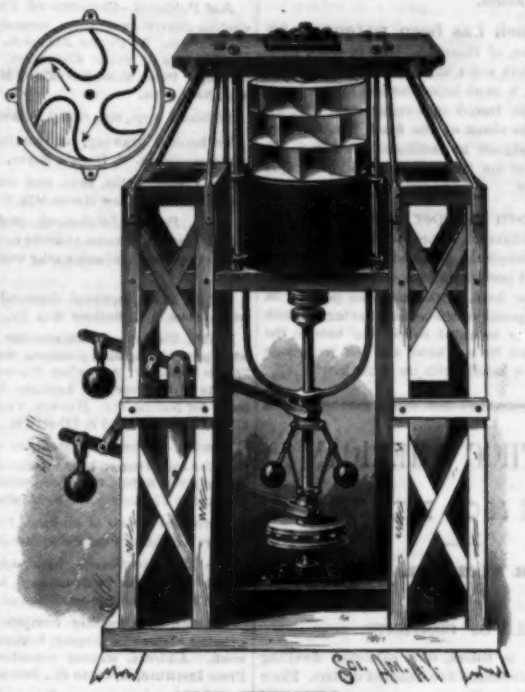
A stop to be used in the construction of door and window frames as an abutment for the door or window, while serving also to cover the crack between the door or window and the jambs, is illustrated herewith, and has been patented by Mr. Noah Van Allen, of No. 149 West Monroe Street, Chicago, Ill. The stop has a

VAN ALLEN'S DOOR OR WINDOW STOP.

longitudinal groove, in which is arranged a packing strip of elastic material, the strip being of less thickness than the groove and secured in the groove at its inner edge only, so that it can be retracted to permit the door to have a full bearing on the stop. Fig. 3 shows an enlarged cross section of the jamb and attached stop, Fig. 2 being a sectional plan view of a portal provided with the stops when the door is closed. With this construction a weather-tight joint is made, obviating the necessity of using weather strips.

AN IMPROVED WINDMILL.

A windmill designed to regulate automatically the speed of the main driving shaft, and which will always act, from whatever direction the wind blows, without the shifting of vanes and other devices, has been patented by Mr. Marcus J. S. Soli, and is illustrated herewith. The windwheel consists of one or more turbines, one above the other, secured near the upper end of the vertical driving shaft, each wheel having top and bottom disks, between which are held curved blades forming orifices for the entrance and exit of the wind, and channels through the wheel, as shown in the sectional view, the turbines being arranged so that the outer edges of each blade break joints, that the wind may act from whatever direction it comes, and on leaving as well as on entering the wheel, as indicated by the arrows. The windwheel is designed to be wholly or partly covered up by a casing, to the lower end of which is secured a U-shaped downwardly extending rod, having a collar in its middle fitting loosely around the vertical driving shaft. The forked ends of a weighted lever, fulcrumed on the main frame, extend beneath the collar, a link connecting this lever with a lower similar one, the forks of which engage a collar on the lower end of a governor secured to the main shaft. When the shaft runs beyond the normal speed the governor balls fly outward, raising the collar on the lower end of the governor, when the lower lever operates to pull down the outer end of the upper lever, thereby raising the casing to fully or partially inclose the windwheel, according to the movement of the governor balls.



SOLI'S WINDMILL.

For further information relative to this invention address Mr. B. H. Lien or Mr. M. J. S. Soli, Brookings, Dakota.

Habits of the Blacksnake.

Blacksnakes always feed on live prey, and possess a power over their prey that is truly wonderful, and I think that birds, old and young, are their main dependence for food—old birds are captured by them with ease. I captured a snake nearly 5 feet long that had a full-fledged song sparrow in its body about 6 inches from its head. They feed on any kind of live prey within their capacity, and have been caught with a young rabbit in their body. They also are successful hunters of birds' nests for the young, and will climb trees in their search. I was once near an orchard when I heard robins making a great outcry, evidently disturbed by something. I went to see the cause, and discovered a large blacksnake at their nest in an apple tree about 15 feet from the ground. The tree was about 1 foot in diameter and 7 or 8 feet up to the branches. The branch on which the nest was, stood off at an angle of about forty-five degrees. When the snake saw me, he glided down on the top side of the branch, and when he reached the trunk he slid off and dropped to the ground. In his mouth was a young bird partly swallowed, which proved such a clog to him that he could not run rapidly in the grass, and I captured him.

Many stories are told of their chasing people. I have seen persons who claim to have been chased by them, and sometimes it was by a racer, a blacksnake with a white ring around its neck. I never saw a snake of that description, and I know of no authority claiming the existence of such a snake. A blacksnake five or six feet long can outrun a man. Their speed I have repeatedly witnessed, when they have escaped from me. Now, if they chase people, why do they not catch them, and if they should catch a person, what could they do with them? Certainly they could not use them as food. It is singular that so many persons have been chased by them, and yet no instance has been reported where they have been caught.

The racer, described as a blacksnake with a white ring around its neck, exists only in the imagination of frightened people. It has no place in natural history, and yet I have known several persons who claim to have been chased by them, and were just as sure of the white ring as they were of being chased.—*Forest and Stream.*

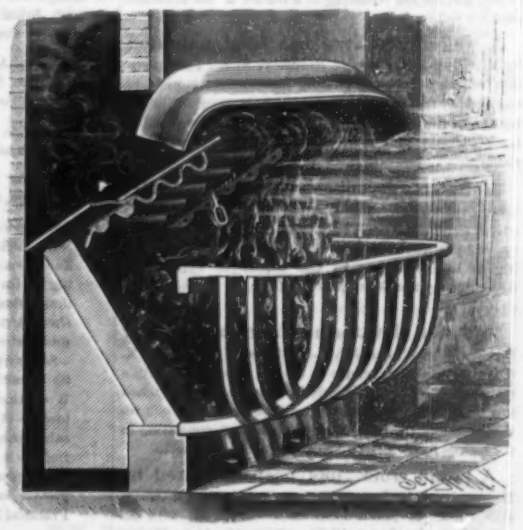
The Steel Ram of the War Ship San Francisco.

The ram for the San Francisco was cast at the Pacific Rolling Mills, San Francisco, last month. A pit shaped like the letter L was dug in the floor of the foundry. It was eight feet deep, twenty feet long in one direction and twenty-five in the other. In this pit was placed the mould. To this pit there was a tramway upon which the ladle, being mounted on wheels, traveled. When the pit was reached, the metal was allowed to flow into the mould in a stream six inches in diameter. When the mould was filled, there was still considerable of the liquid steel left in the ladle. The actual operation of casting the ram occupied but twenty seconds. Whether the results are satisfactory can only be told after the metal has cooled, and that will take several days. It took two months to get ready to perform this twenty-second operation. The operation of casting such a huge amount of metal is very interesting to those who have no knowledge of the process. To insure the complete filling of the mould there were placed two apertures, 18x24 inches in diameter and 4 feet long, called "rising heads," left in the top of the mould, into which the metal rises, and as the metal cools this allows for any shrinkage in the body of the metal. The weight of these two rising heads will approximate 9,500 pounds, the weight of the ram being 13,000 pounds—2,000 pounds heavier than that of the Charleston.

The general shape of the ram is that of a crescent, with one point a little shorter and more curved than the other. The shorter point will extend upward at the bow, and the lower point will run aft under the ship. The curve forms the ram. When in position it will be 20 feet 8 inches from its most forward point to the end of the longer point, and will have a height of 13 feet 10 inches. Where the curve is the thickest—that is, where the vessel would strike when ramming—there is a thickness of 2 feet 9 inches of solid steel.—*Pacific Contractor.*

AN IMPROVED FIREPLACE.

A fireplace designed to facilitate the ready regulation of the amount of draught necessary for free combustion, and with which the heat generated will be retained and directed into the apartment to be heated, is illustrated herewith, and has been patented by Mr. Robert B. Berrie, of Lexington, Mo. A corrugated plate with end flanges is set into the wall, upwardly inclined above the firepot of the grate, the plate having a flat middle part, through a slot in which passes a handle secured to a regulating plate sliding on the rear side of the corrugated plate, the slot having notches adapted to be engaged by the handle to hold the regulating plate at the desired height. The edges of the regulating plate have apertures, as have also the inner ends of the corrugations, to permit the free radiation of heat and prevent the corrugated plate from becoming too hot. Above the grate is held a hood, the moving forward or backward of the regulating plate decreasing or increasing the draught opening formed by the front end of the corrugated plate and the front end of the hood. Under the grate extend one or more channels leading to the chimney, indicated by the arrows, the inner openings of these channels being closed or opened by the lower end of the regulating plate.



BERRIE'S FIREPLACE

ENGINEERING INVENTIONS.

A car door has been patented by Mr. William J. Keyes, of Wheeling, Ala. This invention relates to improvements especially adapted for freight car doors, and provides means for effectively securing the door, and also for readily opening and automatically closing it.

A car seat has been patented by Mr. John C. Buork, of Red Bank, N. J. This invention covers a novel construction and combination of parts, to so improve the striker arms of car seats that an ordinary form of seat may be simply and readily converted into a comfortable reclining seat.

A car coupling has been patented by Mr. Isaac Shotwell, of Bancroft, Mich. This invention provides a novel link lifter and link guide, with means for raising and dropping the pin without the necessity of trainmen going between the cars, the improvement being applicable to the ordinary form of drawhead, link and pin.

A car coupling has been patented by Mr. John Clarridge, Sr., of Libertyville, Ohio. In the drawhead is a spring-pressed follower adapted to support the coupling pin, the follower having a transverse link slot, and there being a second coupling at the rear of the drawhead recess, the device being capable of use for automatic coupling with the ordinary form of link and pin.

AGRICULTURAL INVENTIONS.

A hand planter has been patented by Mr. Thomas N. Lupton, of Winchester, Va. It is an improved device capable of use in planting corn, beans, and other seeds, the device being adapted to be carried by one hand and to have its movable part or parts operated by the handle grasped by the hand.

A cotton scraper and chopper has been patented by Mr. William E. Morris, of Crutchfield, Ky. The machine provided by this invention is for scraping, weeding and freshening the earth at each side of a row of plants, and also to chop the plants to a stand, the scraping and chopping devices being detachable to allow plows, harrows, etc., to be used with the sulky.

A combined plow and harrow has been patented by Anna Trexler, of Sabin, Minn. This invention provides a simple and inexpensive harrow attachment adapted for connection to a plow beam, and operating to pulverize the earth freshly turned over by the plow, to economically and efficiently accomplish the harrowing while the plowing progresses.

MISCELLANEOUS INVENTIONS.

A fire escape has been patented by Mr. Jacob M. Fink, of New York City. This invention provides a ladder of hinged sections, constructed and arranged to be located at the top of a building when not required for use, but which can be readily released and extended down the side of the building.

A bolt has been patented by Mr. John J. Holland, of New Orleans, La. It is for fastening window blinds, doors, etc., and consists of a sliding bar with a hole, a nut being fitted to the blind or door, and a screw fitted to the nut and operative through the bar hole from outside the bar when the bar is projected.

A wrench has been patented by Mr. William H. Brock, of Brooklyn, N. Y. It is of that class in which a chain is used with a serrated shoe to grip the pipe or other article, a dog engaging the chain, the invention covering an improved form of shoe for better gripping the pipe, and a more readily operated dog.

A duplex hand stamp has been patented by Mr. Robert Robinson, of Albany, N. Y. This invention provides an improved stamp for use by conductors, or as a check upon salesmen in any mercantile business, providing for the distribution of coupons to the purchaser and for the retaining of a record of the amounts paid for the coupons.

A wagon end gate has been patented by Mr. Ulysses S. Tym, of Ridgeley, Neb. The invention covers a peculiar locking contrivance applied to one end of the gate, with an eye bolt secured in the bottom of the wagon body, which receives a bevel-ended hook secured to and holding the end gate against rising.

A button has been patented by Mr. Isaac Dreichlinger, of New York City. The invention covers an improvement in buttons on a shank having an eye or loop, and is designed to obviate the lateral swaying or hanging down of the button to expose the fastening, by the use of a novel form of doubled wire shank.

A water elevator has been patented by Messrs. John W. and John J. Adams, of Charlotte, N. C. This invention relates to a form of elevator with a sprocket wheel carrying a chain whose ends are attached to a bucket, the buckets being arranged to have a reverse motion, the improvements patented consisting in the means for reversing the action of the buckets.

A piano truck has been patented by Messrs. Louis Miller and Thomas A. Wheeler, of Greenville, Ohio. It has a base frame on rollers, with detachable vertical frame, sliding adjustable clamp blocks, brace rods, and other novel features, making a movable scaffold for supporting and moving upright pianos on and off a wagon and over steps or stairs.

A straw burning attachment for stoves has been patented by Mr. Myron T. Andrews, of Iroquois, Dakota Ter. The attachment has a pouch forming a front extension to the stove to give increased capacity for holding straw or stalks used for fuel, with a novel construction of grate and means for adjusting it, and means for fitting the appliance to stoves of various sizes.

A reversing switch and rheostat for electric circuits has been patented by Mr. Charles G. Bickley, of New York City. The invention consists in a three-part switch, a series of adjustable resistance coils or bobbins, a contact maker, and in details in the circuit, with especial reference to use in electroplating, to avoid reversals of current from polarization of the electrodes dipping in the electrolyte.

An automatic station indicator has been patented by Mr. Edward Blamey, of Jersey City, N. J. This invention covers a novel construction and combination of parts, whereby a station or street may be automatically indicated within a car, or stations on a main and branch road may be indicated, and wherein the apparatus will automatically advance and reverse, with other novel features.

A pipe wrench has been patented by Mr. Beverly Reagan, of Ouachita, La. It has a fixed jaw with ratchet teeth and a block on its shank carrying a movable jaw, a pawl being carried by the block and arranged to be forced into engagement with the ratchet teeth of the shank of the fixed jaw, the construction being designed to facilitate quick and accurate adjustment of the jaws to clamp and hold pipes of varying diameter.

A rotary corn popper has been patented by Mr. William C. Moore, of Springfield, Mo. It consists of a receptacle mounted on a shaft, and formed with a fixed portion and a portion movable endwise, a fastener for holding the movable portion in open and closed position, the shank having a crank handle and a loosely mounted supporting handle, the holder being grasped in one hand and the receptacle rotated by the crank handle with the other hand.

SCIENTIFIC AMERICAN BUILDING EDITION.

OCTOBER NUMBER.—(No. 26.)

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A company having factory well fitted for manufacturing hardware specialties, tools, etc., desires some lately patented article to make on orders or on royalty. Address A. S. C., P. O. box 1743, New York.

For Sale—U. S. patent, No. 388,321, on sweet potato transplanter. C. E. Tobey, Arkadelphia, Ark.

Just Published—Elements of Electric Lighting, including electric generation, measurement, storage, and distribution. By Phillip Atkinson, A.M., Ph.D., author of Elements of Static Electricity. 300 pages; 104 illustrations. Price, $1.50. For sale by Munn & Co., 361 Broadway, New York.

All books, app., etc., cheap. School of Electricity, N.Y.

Mechanical drawing, calculations, etc., taught by correspondence. L. Donald Boyer, Dayton, Ohio.

Iron Planer, Lathe, Drill, and other machine tools of modern design. New Haven Mfg. Co., New Haven, Conn.

Pratt & Letchworth, Buffalo, N. Y., solicit correspondence relative to manufacturing specialties requiring malleable gray iron, brass, or steel castings.

For the latest improved diamond prospecting drills, address the M. C. Bullock Mfg. Co., Chicago, Ill.

Nickel Plating.—Manufacturers of pure nickel anodes, pure nickel salts, polishing compositions, etc. $100 "*Little Wonder.*" A perfect Electro Plating Machine. Agents of the new Dip Lacquer Kristaline. Complete outfit for plating, etc. Hanson, Van Winkle & Co., Newark, N. J., and 92 and 94 Liberty St., New York.

Wanted—To buy the patents or the right to manufacture the following articles: A Spring or Compressed Air Motor, a Pop Safety Valve and Steam Injector. Address Holland & Thompson, St. Paul, Minn.

Perforated metals of all kinds for all purposes. The Robert Aitchison Perforated Metal Co., Chicago, Ill.

The *Railroad Gazette*, handsomely illustrated, published weekly, at 73 Broadway, New York. Specimen copies free. Send for catalogue of railroad books.

Wanted.—Thoroughly competent men to instruct evening classes in forging, foundry, and machine shop work. Address, stating experience, C. R. Richards, Pratt Institute, Ryerson St., Brooklyn, N. Y.

The Knowles Steam Pump Works, 113 Federal St., Boston, and 93 Liberty St., New York, have just issued a new catalogue, in which are many new and improved forms of Pumping Machinery of the single and duplex, steam and power type. This catalogue will be mailed free of charge on application.

Link Belting and Wheels. Link Belt M. Co., Chicago.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J.

The Holly Manufacturing Co., of Lockport, N. Y., will send their pamphlet, describing water works machinery, and containing reports of tests, on application.

Lockwood's Dictionary of Terms used in the practice of Mechanical Engineering, embracing those current in the drawing office, pattern shop, foundry, fitting, turning, smith's and boiler shop, etc., comprising over 6,000 definitions. Edited by a foreman patternmaker. 1888. Price, $3.00. For sale by Munn & Co., 361 Broadway, New York.

Patents Bought & Sold. H.W. Booth & Co., Detroit, Mich.

Hodges' universal angle union makes pipe connection at any angle. Rollstone Machine Co., Fitchburg, Mass.

The Improved Hydraulic Jacks, Punches, and Tube Expanders. B. Dudgeon, 24 Columbia St., New York.

Wrinkles and Recipes—Compiled from the SCIENTIFIC AMERICAN. A collection of practical suggestions, processes, and directions for the mechanic, the engineer the farmer, and the housekeeper. Illustrated colored frontispiece. Edited by Park Benjamin, Ph.D. Third edition. Price, $2.00. For sale by Munn & Co., 361 Broadway, New York.

Hoisting Engines, Friction Clutch Pulleys, Cut-off Couplings. The D. Frisbie Co., 112 Liberty St., N. Y.

Tight and Slack Barrel Machinery a specialty. John Greenwood & Co., Rochester, N.Y. See illus. adv., p. 28.

For best quality, order your steel castings from the Buffalo Steel Foundry, Buffalo, N. Y.

Belting.—A good lot of second hand belting for sale cheap. Samuel Roberts, 309 Pearl St., New York.

Specially adapted for machine shops—Talcott's combination patent belt hooks. Providence, R. I.

Duplex Steam Pumps. Volker & Felthousen Co., Buffalo, N. Y.

☞ Send for new and complete catalogue of Scientific and other Books for sale by Munn & Co., 361 Broadway, New York. Free on application.

NEW BOOKS AND PUBLICATIONS.

CONKLIN'S HANDY MANUAL OF USEFUL INFORMATION. Chicago: Laird & Lee. Pp. 440. Cloth, 50 cents.

This little pocket reference book is closely crowded with matters both curious and useful, such as all sorts of people are likely to ask questions about. The book has had a phenomenally large sale.

POOR'S MANUAL OF THE RAILROADS OF THE UNITED STATES. 1888. New York: H. V. & H. W. Poor.

This publication, which has now been issued annually for 21 years, brings together in one large volume a vast amount of information of the utmost importance to all who are interested in railroad properties or business. The general exhibit given shows that the total length of railroad lines in the United States laid up to the close of 1887 was 149,912 miles, the mileage of the various roads having been increased during the last calendar year by 13,060 miles. The equipment consisted of 27,950 locomotive engines and 993,805 cars, of which 20,502 were passenger cars, 6,502 were baggage and mail cars, and 956,031 freight cars. The total length of track footed up 189,346 miles, and of this amount 129,959 miles was laid with steel rails, and 60,387 miles with iron rails. The manual also includes the railways of Canada and Mexico, and a directory of the various tramways in the cities of the United States, but, large as is the amount of valuable information furnished in the 1,500 pages of this splendid volume, we wish the publishers could have included in the scope of their work a summary of the railway construction and business of the rest of the world. Such a statement would add to the value of the work.

TURNING LATHES. By James Lukin. New York and London: E. & F. N. Spon. Pp. 160. Price $1.00.

This is a manual for technical schools and apprentices in turning, screw cutting, metal spinning, etc., being an elementary work, presupposing no knowledge of tools or lathes. It has numerous illustrations of tools and lathes, and descriptions of various kinds of work, the directions being such as will be most simple to a young beginner.

THE MECHANIC'S WORKSHOP HANDY BOOK. By Paul N. Hasluck. London: Crosby, Lockwood & Son. Pp. 136. Price 80 cents.

This book is especially for young mechanics interested in the manipulation of metal. There are special chapters on iron, steel, and brass working, and on the principal alloys, on solders and soldering, files and filing, tool grinding, drills and drilling, abrasive and finishing processes, etc. The book has a greater variety and extent of matter than is ordinarily found in such manuals, together with a good index.

THE SHEET JOBBING AND PLATE ROLLER'S ASSISTANT. By C. H. Kaufman. Wheeling: West Va. Publishing Co. Pocket book form. Pp. 267. Price $3.50.

This is a book full of tables designed to assist manufacturers and mill managers in saving time and labor in making calculations, also to assist the boiler maker and sheet iron worker, and the iron roofer, in making estimates for work, and to be of advantage to any one handling sheet iron.

THREE KINGDOMS. A hand book of the Agassiz Association. By Harlan H. Ballard. New York: The Writers' Publishing Co. Pp. 167. Cloth. Price 75 cents.

The Agassiz Association has a membership all over the United States, and to some extent in Canada and England. It is organized in nearly one thousand chapters, having a membership of some fifteen thousand persons, young and old, the object being the systematic study of elementary botany, entomology, geology, anatomy, physiology, etc., under the leadership of competent teachers. This book is designed to answer inquiries concerning the association and its work, and has much valuable information on the collection, preservation, and study of insects, plants, minerals, etc.

SEASIDE AND WAYSIDE. No. 2. By Julia McNair Wright. Boston: D. C. Heath & Co.

This is the second of a series of "nature readers," and describes ants and their work, the earth worm, the house fly, the beetle, the dragon fly, etc., and all in a way well calculated to impart instruction while being delightfully entertaining to the little folks.

WILLIAM SHAKESPEARE PORTRAYED BY HIMSELF. By Robert Waters. New York: Worthington & Co. Pp. 347.

This work is styled by its author "a revelation of the poet in the career and character of one of his own dramatic heroes," and the effort is made to show that Shakespeare is none other than King Henry V.

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(1) B. J. asks (1) a process by which a wrought iron rod can be converted into steel. A. Your iron rod may be made into steel on its surface only by packing it in an iron tube with horn shavings, closing the ends with clay, and heating the whole to a full red for four hours. If kept too long, it will be of little value as a steel rod. It will become blister steel, which is coarse in grain and blistered on the surface. 2. A black enamel for bicycles. A. Use black japan varnish and bake in an oven at about 270° Fah.

(2) C. J.—Compressing two volumes in one of air or any gas, starting at atmospheric pressure, gives a resultant pressure of about 15 lb. per square inch. Electricity cannot be utilized as a motive power except through the aid of mechanical appliances. It can only be generated for power purposes by chemical means (a battery) or by the expenditure of power which may be produced through the agency of steam, water, or wind through engines, water wheels, or wind mills.

(3) W. E. L. asks the process of tempering needles—what kind of oil is used, and what degree of heat is required? A. Use clear lard oil and cherry red heat for the needles. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 51, for the process of manufacture.

(4) J. D. B. asks: 1. Why is it true that, if the direct rays of the sun are permitted to enter a darkened room through a square opening, where they impinge upon the floor or wall, the figure will be round? A. The sun, having sensible magnitude, produces a penumbra. This prevents the reproduction with sharp outlines of the aperture, and hence it is somewhat confused in shape, tending toward a circle. This refers to an opening of large size. If the opening is very small, not much larger in area than a pinhole, then a "pinhole" image of the sun will be produced. The production of such an image depends on the practical cutting off of all except one set of rays emerging from the sun. 2. Do motions possess the quality of cohesive attraction? A. No. 3. Is it not true in physics, as in physic and in politics, that we are expected to accept the dictum of some man as leaving nothing further to be said, and whose *ipse dixit* it were rank heresy to question? A. We know of no *ipse dixit* in physic, politics, or physics. The assertion of the highest authority is open to contradiction or discussion.

(5) R. Y. asks: 1. Is it necessary for the discharge end of a siphon pipe to be submerged in water to insure a continuous flow? A. No; provided the pipe is unobstructed for its full length. If partially stopped, so that there is a slow discharge, air may enter and stop the siphon from working. 2. What is the theoretical difference in the length of the pipe from the apex to the fountain, and from the same point to the discharge in order to insure a continuous flow? A. Any difference in length will insure a flow toward the longer leg. The height must not exceed 33 feet, as this is the limit of action.

(6) F. T. P. asks (1) how salicylic acid is made. A. Salicylic acid is made by treating sodium phenol (carbolic acid and soda) with carbonic acid gas. Caustic soda solution is evaporated with a proper amount of carbolic acid to a dry powder, and carbonic acid gas is passed over it while warm, the temperature being gradually increased from 212° Fah. to 482° Fah. Carbolic acid is made from coal tar. 2. Is salicylic acid injurious to the system? A. It has an injurious effect upon the system when taken in sufficient quantities. The effect of minute amounts long continued cannot yet be considered established.

(7) Shep asks what commercial value (if any) solidified petroleum or solidified kerosene has, and also mention some of the uses to which it could be put. A. It is impossible to say what value solidified petroleum would have. It is mainly as a method of preparing it for transportation that inventors have worked upon the problem. It has been suggested that it might be used as a fuel.

(8) R. B. H. asks: At what distance (in feet) would an iron steamship cause a deflection of a sensitive compass needle? A. The exact distance cannot well be stated. Probably a distance of one hundred feet would practically prevent deflective influence.

(9) F. L. writes: A sheet of zinc about a foot square was accidentally dropped into a well. Will it poison or injure the water, so as to make it unfit for drinking purposes? A. While it is doubtful if the zinc will seriously contaminate the water, it would be good policy to remove it.

(10) J. J. B. asks: What will remove paint from window glass? A. Try solution of washing soda. If this is not strong enough, use caustic soda. These solutions will spot any other paint that they may fall upon.

(11) J. P. S. asks: 1. If there is a remedy to stop show windows from sweating in cold weather. A. Ventilation from the top is the most efficacious method in general use. 2. What will drive away or kill cockroaches that infest dwellings? A. Powdered borax is sometimes very effectual.

(12) R. W. W. writes: I wish to make a balloon of 4 or 4½ feet in diameter, suitable to raise a two-pound detective camera. What would be the best material (rubber, gutta percha, gold beater's skin, or what), and how should the seams be cemented? What dimensions would be necessary if coal gas was used instead of pure hydrogen? A. If filled with pure hydrogen, the gas contained in your balloon would have a lifting capacity of about 2½ lb.: as it would have to carry the weight of the balloon as well as camera, it would be far too small. With coal gas it would have about one-half the above lifting power. Silk varnished with a mixture of India rubber, linseed oil, dissolved in essence of turpentine, would be a good material. In storing it, the balloon should be suspended to prevent the varnish from heating. Your balloon should be about 8 feet in diameter for hydrogen, and 10 feet for coal gas, and even then unless the silk was very light and the varnish very thin, it is doubtful if it would have enough ascensional power.

(13) A. C. S. asks: 1. How to make asbestos a conductor of electricity. A. Soak it in nitrate of silver, dry, and expose to hydrogen gas, or ignite at a red heat. Or you may dip it in bichloride of platinum solution, then in chloride of ammonium, and ignite. 2. If a disk of any light material, about twenty feet in diameter, rests on a fine pivot (on the style of a compass dial), and the pivot is revolved very slowly, will the disk make as many revolutions as the pivot, or will there be a constant slip between the pivot and the disk? A. If the point is sharp and has a hard, smooth bearing, there will be a constant slip.

(14) D. D. C. asks: 1. Can brass or copper be silver plated without a battery, if so, how? A. Not very satisfactorily. 2. Will it be durable? A. The coating will be thin and not very durable.

(15) J. N.—Block tin is the only commercially successful lining ever used for soda water fountains. Glass fountains inclosed in iron or steel bands or cases have been used, but are very heavy and somewhat fragile. There is nothing dangerous in iron, though it may affect the color and taste of the water slightly.

(16) H. P. asks: Can you tell me if any one in this country has tried to get the coating of tin off the scrap from can and tinware factories? If so what process is used, and oblige? A. This has never been successfully accomplished, though many attempts have been made to do it. A practical process would be very valuable.

(17) F. E. W. asks: What is the process and apparatus used in the manufacture of gas retort carbon black? A. The material in question is formed as a by-product in the manufacture of gas from bituminous coal. The hydrocarbons are decomposed by the heated walls of the retort, and carbon separates and is deposited in hard masses upon the back and upper surfaces of the retorts.

(18) S. W. R. writes: Replying to a query in your issue of September 1, you say that there is no substance that if placed between the poles of a magnet and its armature will counteract or insulate the magnetism. Now, I am puzzled to understand the principle of the "magnetic watch shield." Supposing that I had a proper grip on this law of magnetism, I have always held that these "shields" are frauds, but I find that their popularity is increasing, and that many of the case makers make their cases so fitted or not as ordered, and I notice also that some of the railroads that require a certain grade of watch to be used by their employes, specify the "magnetic shield" among other requirements. If you can enlighten me as to the composition of these "shields," and their general usefulness and the principles involved therein, it will be appreciated. A. Magnetic watch shields are not frauds. They operate, not by insulating the magnetism, but being made of iron they practically absorb it, acting like an armature of any neighboring magnet, and disposing of the lines of force before they can reach the inclosed watch. These lines of force are principally kept within the metal of the shield, so that the watch is partially protected.

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